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CONTROL DAT
CORPORATION

CONTROL DATA®
FIELD TEST UNIT
TB304

GENERAL DESCRIPTION
OPERATION
THEORY OF OPERATION
MAINTENANCE
DIAGRAMS
WIRE LISTS
PARTS DATA

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

REVISION	DESCRIPTION
01	Preliminary Release
(6-1-76)	
A	Manual Released. Includes ECO's 48212, 48217, 48225, 48238.
(9-15-76)	
B	Add ECO PE48224 for 50-pin I/O cables, make miscellaneous editorial corrections
(11-29-76)	as indicated by "B" REV column of List of Effective Pages (page iii).
C	Include models B and C, each with MMD capability. Provide ruggedized packag-
(4-15-77)	ing. ECOs incorporated: PE48435, PE48474, PE48476, PE54002, PE50059, PE54009.
	This edition obsoletes all previous editions.
D	Incorporate ECOs PE54015, 54018, 54023, 54029. Add part numbers for
(6-2-77)	FTU models. Add clarification to certain operating/maintenance procedures.
	Make miscellaneous editiorial changes, including consistency in nomenclature
	on logic diagrams.

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Address comments concerning this manual to:

Control Data Corporation
Technical Publications Dept.
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Minneapolis, Mn. 55435

or use Comment Sheet in the back of this manual.

LIST OF EFFECTIVE PAGES

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PREFACE

This manual has been prepared for customer engineers and other technical personnel who will be using the TB304 Field Test Unit (FTU) to assist in troubleshooting the Storage Module Drive (SMD) and the Mini-Module Drive (MMD). The FTU is available in three versions:

TB304A - Exercise/test SMDs only, plus head alignment capability.

TB304B - Exercise/test both SMDs and MMDs, plus head alignment capability for SMDs.

TB304C - Exercise/test both SMDs and MMDs; no head alignment capability.

All B and C versions of the TB304, and all A versions with serial numbers 201 and above, are ruggedized to minimize damage during transportation and handling.

Personnel using this manual should already be familiar with the computer system, drive controller and drive logic, as well as system programming techniques for executing I/O operations, including the proper sequencing of I/O commands and signals between the drive and its controller.

The manual is divided into seven sections as follows:

Section 1 - General Description. Contains the physical description and functional specifications for the FTU.

Section 2 - Operation. Provides installation information and procedures for operating the FTU in all modes, as well as steps to take when error lights appear on the FTU control panel.

Section 3 - Theory of Operation. Makes extensive use of flowcharts to show the FTU logic sequencing during the various operating modes.

Section 4 - Maintenance. Contains procedures for adjusting the ±5 V dc supplies and describes how to use sections 2, 3, and 5 to troubleshoot the FTU.

Section 5 - Diagrams. Contains logic diagrams, schematic diagrams of the power supplies and "locator" drawings showing the physical lay-out of the parts in each electrical assembly.

Section 6 - Wire List. Shows point-to-point wiring of the ICs on the logic board.

Section 7 - Parts Data. Provides an exploded view of the TB304 and a breakdown of field replaceable parts.

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TB304 A DIAGRAMS

FIGURES

TABLES

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

The CONTROL DATA® TB304 Field Test Unit (FTU) is a portable, self-contained tester for exercising and/or simulating on-line operations in Storage Module Drives (SMDs), series BJ4, BJ5, BJ7, BK4, BK5, BK6 and BK7, as well as Mini-Module Drives (MMDs) in the BZ3 or BZ4 series.

The FTU is housed in a suitcase-type carrying case that provides a control panel, a logic board, and an integral power supply. The case contains space for storing the power cable, all necessary I/O cables, and a head alignment card.* The head alignment card plugs into the logic chassis of the SMD and permits individual head alignment, using a null meter mounted in the FTU control panel. In addition, a special I/O bypass cable is provided that enables head alignment and servo maintenance to be performed without disconnecting the I/O cables between the drive and its controller.

SPECIFICATIONS

Specifications for the TB304 are given in table 1-1.

FUNCTIONAL DESCRIPTION

The TB304 provides five access (seek) modes, four read/write modes, and two modes for determining head selection.

ACCESS MODES

Direct Seek

The drive under test will perform a single seek to the track number set in the CYLINDER ADDRESS switches on the FTU control panel.

Continuous Seek

The drive under test will perform repetitive seeks between any two tracks selected by the operator. Operation will continue until the START/STOP switch on the FTU control panel is moved to STOP (STOP switch actuated).

Sequential Forward Seek

The drive under test will perform single-track incremental seeks until the last track is reached, then seek to track 00 and continue incremental seeks in the same manner until the STOP switch is actuated.

Sequential Reverse Seek

The drive under test will perform single-track decremental seeks, starting with the track nominated by the CYLINDER ADDRESS switches, until track 00 is reached. The drive will then return to the nominated track and repeat the operation until the STOP switch is actuated.

Random Seek

The drive under test will perform seeks to random tracks as selected by a free-running counter within the FTU. Operation will continue until the STOP switch is actuated.

READ/WRITE MODES

The TB304 generates serial NRZ write data at a rate determined by the servo clock signals transmitted from the unit under test. When a repeated access mode is selected (that is, any mode except Direct), a read/write operation will be completed at the selected cylinder, after which a seek will be initiated to the next cylinder address (as determined by the access mode) and the read/write operation repeated. This seek-read/write sequencing will continue until the STOP switch is actuated or an error occurs. For Direct seeks, the R/W operation will continue at the selected track or cylinder (depending upon the head select mode) until the STOP switch is actuated.

The number of tracks read or written during each R/W operation is controlled by the mode of head selection chosen. For manual head selection, only the track under the head selected by the HEAD ADDRESS switches will be read or written. For sequential head selection, the heads will be sequenced so as to read or write each track in the cylinder. When the highest-numbered head (or cylinder track) has been exercised, the drive will seek to another cylinder (except in Direct Seek) and the R/W operation will be repeated at that new cylinder, starting with head 00.

Write Format

When the FTU WRT-RD SELECT switch is set to WRT FORMAT, the FTU will write each selected

* Head alignment card not supplied with TB304C.

TABLE 1-1. TB304 SPECIFICATIONS

Characteristic	Condition	Specification
Size	L x W x H	20.5 x 16.0 x 8.0 inches (52.0 x 40.6 x 20.3 cm)
Weight		43 lbs (19.5 kg)
Temperature	Operating	+60°F to +90°F (15.5°C to +32°C)
	Gradient (rise per hour)	+12°F (+6.6°C)
	Non-operating	+30°F to +150°F (-34°C to +66°C)
Relative Humidity (no condensation)	Operating	20% to 80%
	Non-operating	5% to 95%
Altitude	Operating	-1000 ft to +10,000 ft (-306 m to +3048 m)
	Non-operating	-1000 ft to +35,000 ft (-306 m to +10.7 km)
Input Power	50/60 Hz, single phase	120 (+8, -18) V ac @ 1.5 A, max. 240 (+17, -27) V ac @ 0.8 A, max. (conversion is via terminal board in power supply)
Minimum Input Voltage	120 V ac	90 V ac (100 V ac nominal, ±10%)
	240 V ac	180 V ac (200 nominal, ±10%)

track with the appropriate track address and a repetitive 8-bit data pattern that has been set in the DATA PATTERN switches on the FTU control panel. The FTU also provides a means for indicating a defective track when using the Write Format mode.

Write

When the FTU WRT-RD SELECT switch is set to WRT, the FTU will write the repetitive 8-bit data pattern on the selected track, after having first read and verified the track address.

Read

When the FTU WRT-RD SELECT switch is set to RD, the FTU will read the data from the selected track, after having first read and verified the track address.

Write Then Read

When the FTU WRT-RD SELECT switch is set to WRT•RD, the FTU will verify the track address and write the 8-bit data pattern on the selected track during one revolution of the drive, then verify the track address and read back the data during the second revolution.

A fifth position (OFF) of the WRT-RD SELECT switch is available for "access only" operations. This position is also used during the head alignment procedure.

SECTION 2

OPERATION

INTRODUCTION

This section provides installation information for the TB304, including the purpose and use of the various cables supplied with the tester, and gives detailed operating instructions for the many test procedures that are possible with the FTU. A general view of the FTU and its associated hardware is shown in figure 2-1.

INSTALLATION

OPERATING VOLTAGE

The FTU is connected at the factory for use with a 120-V ac 50/60-Hz power source. To reconnect for 240-V ac operation, proceed as follows.

1. Open the FTU cover. Unhinge cover and set aside if desired.
2. Raise the control panel.
3. Remove head alignment card from its compartment on top of the power supply box.
4. Remove four screws securing cover plate of power supply; remove the cover plate.
5. Remove jumper straps connecting terminals 1 and 2, and terminals 3 and 4 of A1TB1.
6. Install both jumpers so as to connect terminals 2 and 3.
7. Replace and secure the power supply cover plate.
8. Replace the head alignment card in its compartment.
9. Procure a 120-to-240 V ac conversion plug from a local supply house and attach to the FTU power cord plug. Alternatively, remove the molded 3-prong plug attached to the FTU line cord and install one suitable for 240-V ac receptacles.

The FTU is now ready for 240 V ac operation.

I/O CABLES

Five I/O cables are provided. The standard A-cable has a 75-pin block-type connector on each end. The standard B-cable is equipped with two 34-pin block-type connectors. For sites that use any of the BK series SMD's, two adapter cables are provided for converting the block connectors on the standard I/O cables to the flat connectors on the BK-series machines.

The fifth cable is the I/O Bypass cable that contains a 28-pin female connector on one end, the other end fanning out to two 14-pin male connectors. These male connectors plug into locations F01 (P1) and F06 (P2) on the FTU logic board. Pin 1 of the 14-pin connectors P1 and P2 should be aligned with pin 2 of the 16-pin locations on the logic board. The 28-pin connector (P3) connects to the drive logic chassis according to the type of drive under test. Table 2-1 provides the information needed. (See also cross-reference numbers 400 and 403 (c.r. 400, 403) in the Diagrams section.)

HEAD ALIGNMENT CABLE

SMD head alignment using the TB304A/B requires installing the special head alignment card in the proper position of the drive logic

TABLE 2-1. CONNECTING I/O BYPASS CABLE TO DRIVE

SMD Series	Connect 28-pin connector P3 to
BJ4xx	JA84
BJ5xx	JA3 *
BJ7xx	JA3 *
BK4xx	A02 **
BK5xx	A02 **
BK6xx	JA84
BK7xx	JA84

* Plugs into card side of logic chassis. Others slip over W/W pins on back (wire-wrap) side of logic chassis at locations shown.

** Pin 1 of P3 corresponds to pin 16 of A02

NOTE

The I/O Bypass cable is useful when doing head alignment and for exercising the drive access mechanism. Read/write operations, however, cannot be performed using the Bypass cable.

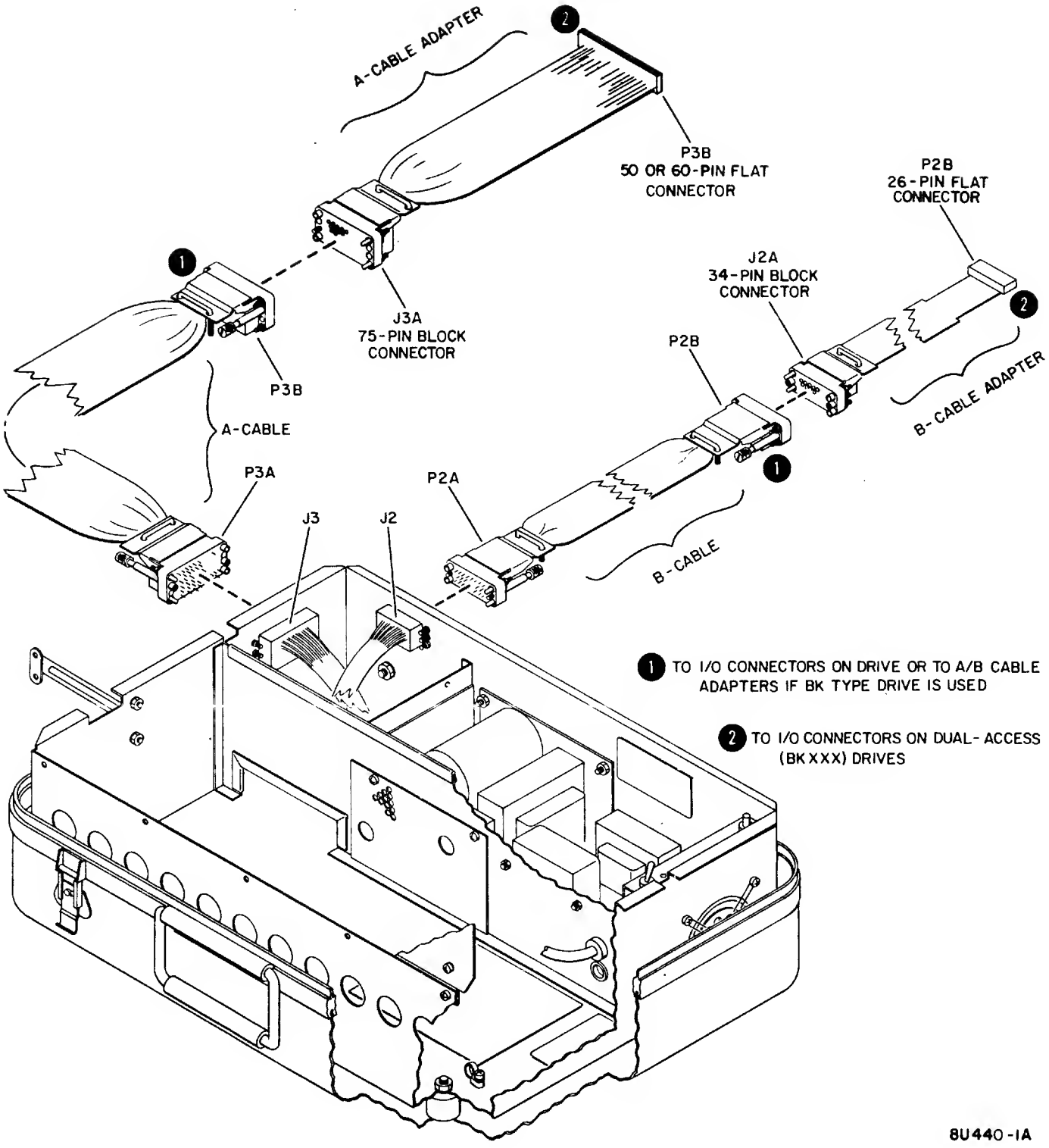


Figure 2-1. TB304 and Associated Hardware (Sheet 1)

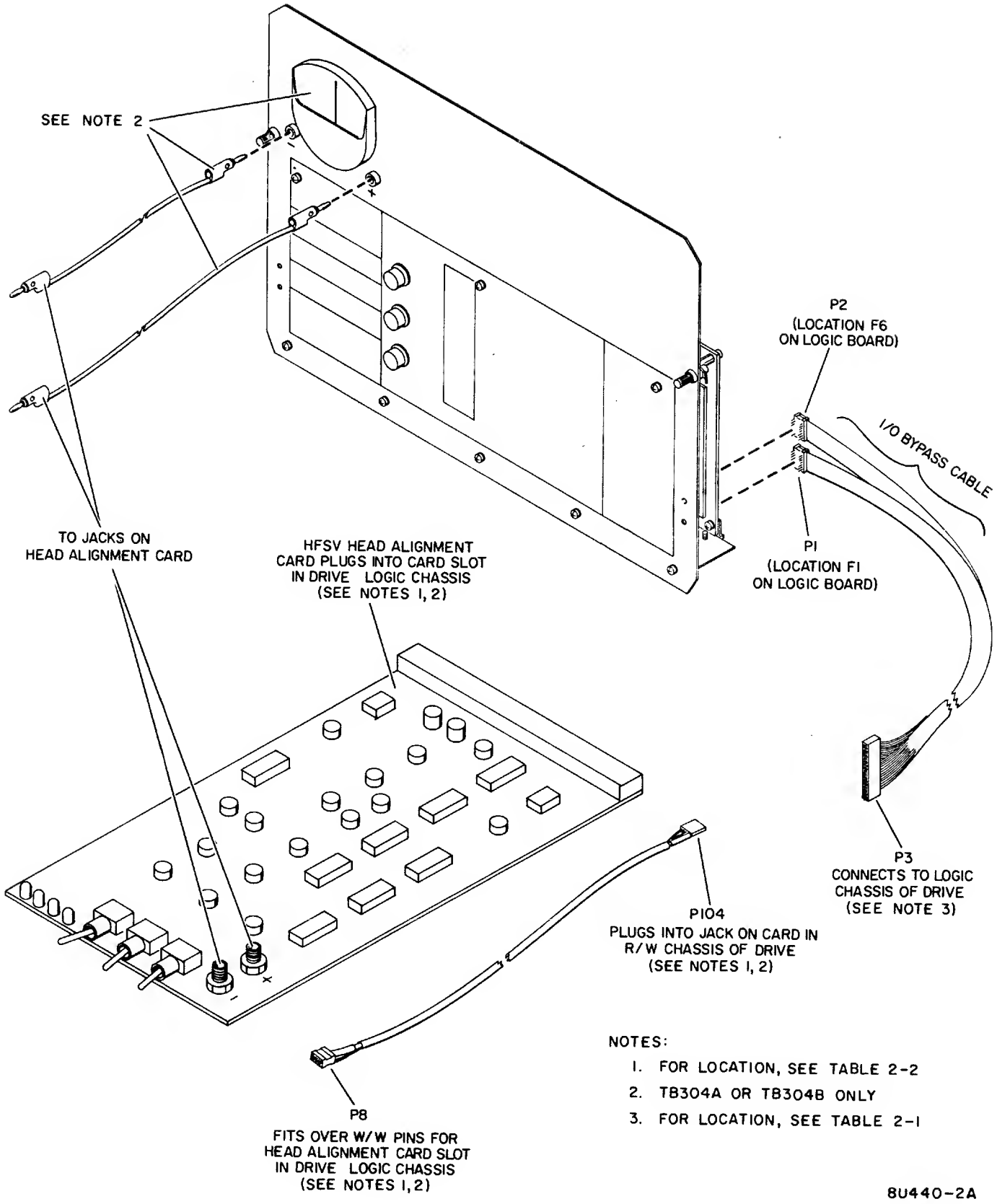
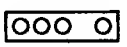
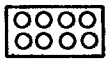


Figure 2-1. TB304 and Associated Hardware (Sheet 2)

chassis, and connecting the 4-wire head alignment cable between the logic chassis and the appropriate jack in the drive's R/W assembly. Table 2-2 gives the needed information for the various SMD series. A pair of test leads (provided) is then installed between the banana jacks on the head alignment card and the null meter on the FTU control panel.

TABLE 2-2. HEAD ALIGNMENT CONNECTIONS (SMD ONLY)

SMD Series	Head Alignment Card Location	Head Alignment Cable	
		P104 	P8 
BJ5xx	A08	Plugs into J104 on Head Select/Read Amplifier card in R/W chassis.	Slips over W/W pins 8A,B through 11A,B at location reserved for Head Alignment card. (See column at left.)
BJ7xx	A08		
BK4xx	A02		
BK5xx	A02		
BJ4xx	A16	Plugs into J1 on Read Amplifier card in location E03 of R/W chassis.	
BK6xx	A16		
BK7xx	A16		

CONTROLS AND INDICATORS

Except for the power switch and circuit breaker mounted on the power supply box, and the sector switches mounted in location A20 on the logic board, all controls and indicators for operation of the TB304 are located on the control panel (figure 2-2). The controls and indicators are described below, moving from top left to bottom right across the panel. An asterisk following the switch or indicator name denotes that it is for use only with the standard I/O cables. That is, the function/indication is not provided when the I/O Bypass cable is used in lieu of the standard A and B cables. Sector switch settings are given in table 2-3.

+5 V, -5 V indicators — Indicate that the respective power supply voltages are present.

SERVO OFFSET switch — A 3-position switch with center "off":

- **+** — Commands the drive to offset the carriage in the positive direction (toward the spindle).
- **center** — Nominal positioning (no offset).
- **-** — Commands the drive to offset the carriage in the negative direction (away from the spindle).

NOTE

The START/STOP switch must be actuated to effect any change in offset by the drive when in Direct mode.

DATA STROBE* switch — A 3-position switch with center "off":

- **EARLY** — Moves the drive Read strobes from nominal to an earlier time with respect to data.
- **center** — Drive strobes at nominal timing.
- **LATE** — Moves the drive Read strobes from nominal to a later time, with respect to data.

WRT FLAG* switch — When moved up, this switch causes a Defective Track flag bit to be inserted in Bit 6 of Address Word 1, provided that:

a. WRT-RD SELECT switch is set to WRT FORMAT
b. ACCESS MODE switch is set to DIRECT.
c. Head Select switch (SEQ-MAN) is set to MAN.

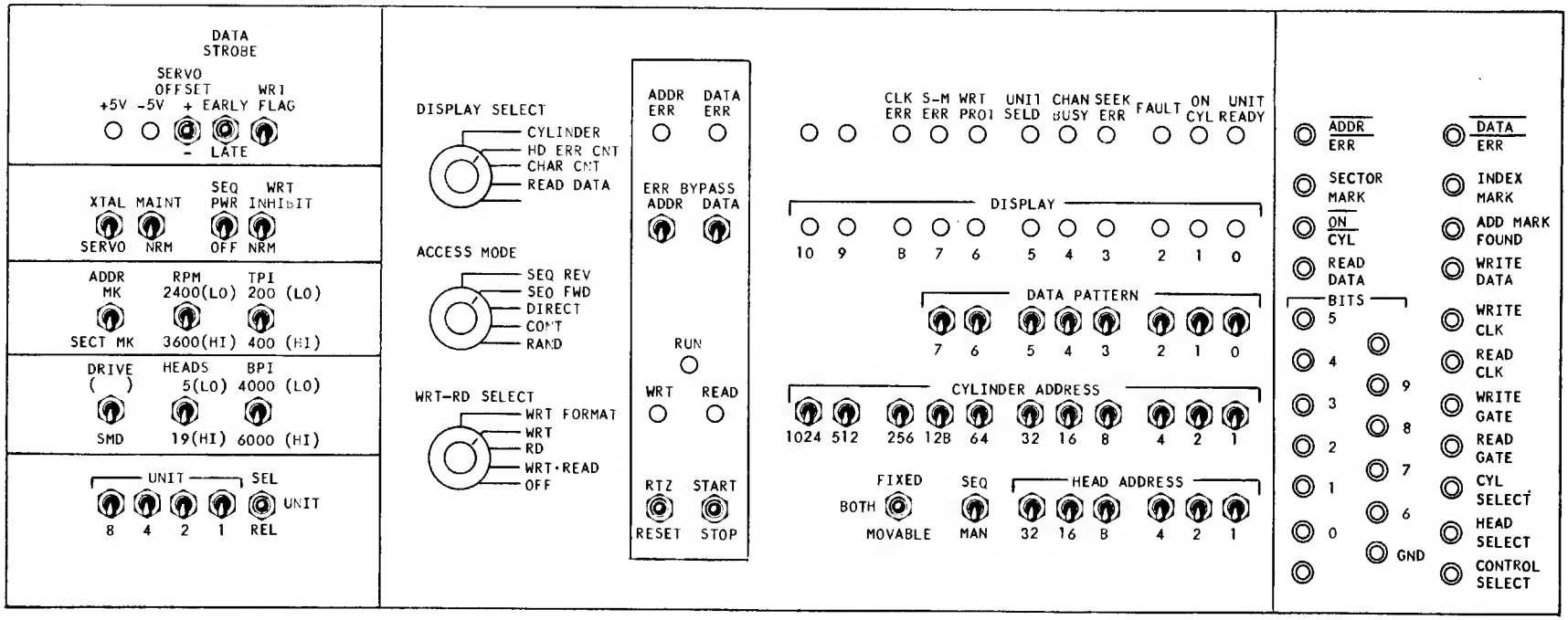


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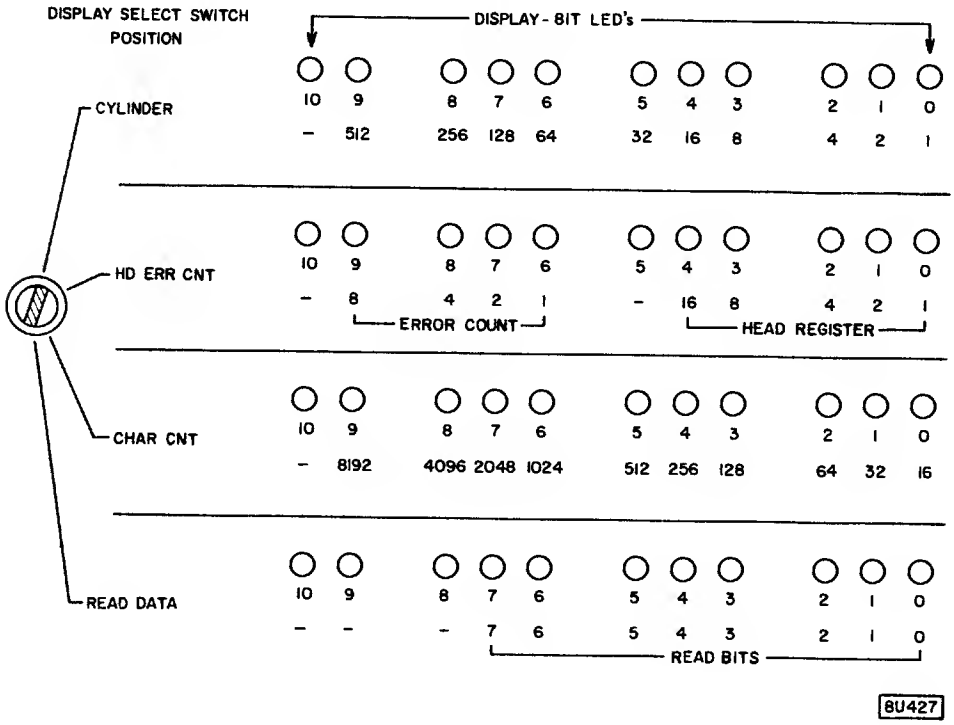
Figure 2-2. TB304 Control Panel

XTAL/SERVO switch	XTAL	A crystal oscillator within the FTU provides a nominal 9.667 MHz clock signal. Used for tester maintenance.
	SERVO	Servo Clock signals from the drive provide the basic timing for the FTU.
MAINT/NRM switch	MAINT	Used to perform maintenance on the FTU without a drive connected. Provides pseudo Ready and On Cylinder signals to simulate a drive response.
	NRM	Normal testing of a drive is done in this position.
SEQ PWR/OFF* switch	SEQ PWR	In this position, the FTU commands the drive to power up, provided that: a. The drive is in the REMOTE mode. b. Primary power is available at the drive. c. The drive START switch is ON (indicator lighted).
	OFF	In this position, the FTU cannot power-up the drive.
WRT INHIBIT/NRM* switch	WRT INHIBIT	Prevents writing by the drive. Writing is inhibited even though all other FTU switches are set to perform a write operation.
	NRM	Allows a normal Write operation in the drive, provided that other FTU switches are set to perform a write operation.
ADDR MK/SECTOR MK* switch	ADDR MK	The FTU writes an Address Mark when in the Write Format mode, or reads the Address Mark in other active positions of the WRT-RD SELECT switch.
	SECTOR MK	Disables the writing or reading of Address Marks; permits reading of Sector Marks only.
RPM switch	2400 (Lo) 3600 (Hi)	Set to speed of drive under test. (Not used in TB304A.)
TPI switch	200 (Lo) 400 (Hi)	Must be set to correspond to the number of tracks per inch of the drive under test.
DRIVE switch	( ) SMD	Preconditions the RPM, TPI, BPI, and HEADS switches on the FTU panel to the parameters of the drive under test.
HEADS switch	5 (Lo) 19 (Hi)	Must be set to correspond to the number of heads present in the drive under test.
BPI switch	4000 6000	Must be set to correspond to the bits-per-inch rating of the drive under test.
UNIT* switches	8 4 2 1	Used to indicate the binary value of the four Unit Select lines to the drive. This code must match that of the logic plug in the drive under test.
UNIT SEL/REL* switch	A 3-position, center-off switch with locking "up" end momentary "down" positions:	
	SEL	(locking) Sends a Unit Select Tag to the drive under test.
	Center	Drops the Unit Select Tag to the drive under test.
	REL	(momentary) Sends a Release signal for dual-access drives. Has no function for single-access drives.

DISPLAY SELECT switch

A 4-position rotary switch that controls the eleven DISPLAY lamps on the FTU control panel. The interpretation of the display is shown below. When the switch is set on READ DATA, the cylinder address will be displayed as long as the FTU is running. The data pattern read will be displayed if the FTU has stopped because of a data error, otherwise the display will be zeros.



ACCESS MODE switch

A 5-position rotary switch that controls the Seek (access) mode of the drive under Test:

SEQ REV — (Sequential Reverse) The drive seeks to the address in the FTU Cylinder Address switches, sequences down to zero, and then repeats.

SEQ FWD — (Sequential Forward) The drive performs a series of incremental seeks, starting with the address that is in the Cylinder Address register at the start of the operation. When maximum cylinder address is reached, the cycle begins again at address zero.

DIRECT — The drive seeks to the address in the Cylinder Address switches. Seeking to another address requires changing the address in the switches and manually initiating another Seek operation by actuating the START switch.

CONT — (Continuous) The drive seeks alternately between the address in the Cylinder Address switches and that in the Cylinder Address register (CAR). The contents of CAR does not change during this operation.

RAND — (Random) The drive seeks to random addresses generated by increasing the count in the CAR during the time that the drive is not "on cylinder".

WRT-RD SELECT* switch

A 5-position rotary switch that determines the manner in which data will be exchanged between the FTU and the drive under test:

- **WRT FORMAT** (Write Format) Writes an Address Mark (if selected), the correct Track Address (HA and CA), and a pre-selected 8-bit Data Pattern field on each selected track. The format is as shown in figure 2-3.
- **WRT** (Write) Writes a pre-selected pattern in the Data field of each selected track, after first verifying the Track Address.
- **RD** (Read) Verifies the Track Address, then reads the selected track.
- **WRT•READ** (Write Then Read) Verifies the Track Address, writes the Data field on the selected track, then reads the track. (Operation requires two revolutions.)
- **OFF** Disables all Read/Write functions; restricts the drive under test to Seek operations only.

ADDR ERROR* indicator

Indicates that the address information received from the drive differs from the address requested, or that an Address Mark is missing when reading in the Address Mark mode, or that the Address sync bit was not received from the drive.

DATA ERROR* indicator

Indicates that the 8-bit data pattern received from the drive differs from the pattern set in the DATA PATTERN switches.

ERROR BYPASS* switches

- **ADDR** (Address) If this switch is in the "up" position, it allows the FTU to continue operating when an Address or S-M error occurs. In the "down" position, an Address error will stop the FTU.
- **DATA** If this switch is in the "up" position, it allows the FTU to continue operating when a Data error occurs. In the "down" position, a Data error will stop the FTU.

RUN indicator

Indicates that the FTU is running or that the RTZ switch (Return to Zero) is being actuated. Five conditions will turn off the indicator.

a. Returning the RTZ switch to neutral (but provided that RUN was not lit before the RTZ operation).
b. A valid (unbypassed) error.
c. Actuating the STOP switch.
d. Actuating the RESET switch
e. If the Ready signal from the drive goes low.

WRT indicator

Indicates that the FTU is writing.

RD indicator

Indicates that the FTU is reading.

RTZ/RESET switch

A 3-position momentray switch with center "off":

- **RTZ** Clears HAR and CAR; clears the drive's Fault register and causes the drive to perform a Return-to-Zero seek. The RUN light on the FTU control panel will be lit as long as this switch is actuated to the RTZ position.
- **center** Neutral position.
- **RESET** Clears the Error FF's in the FTU and the drive. This switch must be actuated after a valid error has occurred in order to be able to restart the FTU.

START/STOP switch

A 3-position momentary switch with center "off":

START — Generates a pulse that starts the FTU; turns on the RUN indicator. An existing Error condition must be cleared by actuating the RESET switch before START will have any effect.

center — Neutral position.

STOP — Stops the FTU; extinguishes the RUN indicator.

CLK ERROR indicator

Indicates that a period of 200 nanoseconds has expired without a servo clock pulse from the drive under test.

S M ERROR* indicator

Indicates that an incorrect number of Sector Marks was received from the drive under test between successive Index Marks.

WRT PROTECT* indicator

Indicates the presence of a Write Protect signal from the drive under test.

UNIT SELD* indicator

Indicates the presence of a Unit Selected signal from the drive under test.

CHAN BUSY* indicator

Indicates the presence of a Channel Busy signal from the drive under test.

SEEK ERROR* indicator

Indicates the presence of a Seek Error signal from the drive under test.

FAULT* indicator

Indicates the presence of a Fault signal from the drive under test.

ON CYL indicator

Indicates the presence of an On Cylinder signal from the drive under test, or a pseudo On Cylinder signal generated by the FTU if in Maintenance mode.

UNIT READY indicator

Indicates the presence of a Ready signal. This signal comes from the drive if the A and B I/O cables are connected between the drive and the FTU. If the I/O Bypass cable is connected, this signal is present continuously.

DISPLAY indicators

Refer to diagram shown for the DISPLAY SELECT switch (page 2-7).

DATA PATTERN switches

These switches permit setting the repetitive 8-bit Data Pattern that is written in the Data field of the selected track during a Write operation. For Read operations, the data read from the track is compared with these switches to check for the presence of a Read error. A 1 is indicated when a switch is in the "up" position, a 0 when the switch is "down".

CYLINDER ADDRESS switches

These switches enter the binary value of the cylinder address to which a Seek is desired. Used in conjunction with the ACCESS MODE switch described on page 2-7. A 1 is indicated when a switch is in the "up" position, a 0 when the switch is "down".

FIXED/BOTH MOVABLE switch

This switch is functional only when the DRIVE switch on the FTU panel is in the "up" ( ) position.

FIXED ① — The FTU will access only fixed heads in the Sequential access mode. When in Random access mode, the cylinder address may not be random because of inconsistencies in clock frequency and Off Cylinder times.

BOTH ① — The FTU will access both movable and fixed heads when in Sequential or Random access modes.

MOVABLE — The FTU will access only the movable heads when operating in Sequential or Random access modes.

① To access all fixed heads, the SEQ/MAN head switch must be in SEQ.

SEQ/MAN switch

This switch determines the manner in which the head address is selected.

SEQ (Sequential) After performing a Write or Read operation the FTU increases the count in the Head Address Register by 1 for each Index Mark or, when in Random, for each access. When the count is maximum (5 or 19), Head zero is the next head selected, and the incrementing continues.

MAN (Manual) The FTU will select the head address set in the Head Address switches.

$\overline{\text{ADDR ERROR}}$* test point

This test point goes to a logical 0 when an Address Error occurs.

$\overline{\text{DATA ERROR}}$* test point

This test point goes to a logical 0 when a Data Error occurs.

SECTOR MARK* test point

This test point goes to a logical 1 when the FTU receives a Sector Mark signal from the drive under test.

INDEX MARK test point

This test point goes to a logical 1 when the FTU receives an Index Mark signal from the drive under test.

$\overline{\text{ON CYL}}$ test point

This test point will be a logical 0 when the drive under test is On Cylinder.

ADD MARK FOUND test point

This test point goes to a logical 1 when the FTU receives an Address Mark Found signal from the drive under test.

READ DATA* test point

This test point reflects the binary value of the serial data bits being received from the drive under test during a Read operation. The test point is inoperative during Maintenance mode or when the I/O Bypass cable is installed.

WRITE DATA test point

This test point reflects the binary value of the serial data bits being processed by the FTU during a Write operation ("0"=0, "1"=1). The indication is valid for any Write operation, even though the I/O Bypass cable may be connected or the FTU is in the Maintenance mode. The test point remains a logical 0 during Read operations.

BITS 0-9 test points

These ten test points reflect the logical value of the Bus Out Bits (BOB) delivered to the drive under test via the A cable. Logically, these bits are present in the FTU's Bus Out multiplexer, and are available at the test point panel regardless of the operating mode (including Maintenance mode or I/O Bypass cable connected) of the TB304. For an interpretation of the specific Bus Out Bits, see table 3-1.

GND test point

This test point is a common ground point between the FTU logic board and the control panel.

WRITE CLK test point

This test point reflects the logic level of the 9.667 MHz Write Clock signal that the FTU sends to the drive under test during any Write operation.

READ CLK* test point

This test point reflects the logic level of the 9.667 MHz Read Clock signal received from the drive under test during any Read operation. A Read Error forces the test point to logical zero.

WRITE GATE test point

A logical 1 at this test point indicates the presence of a Write Gate signal generated by the FTU during any Write operation.

READ GATE test point

A logical 1 at this test point indicates the presence of a Read Gate signal generated by the FTU during any Read operation.

CYL SELECT test point

This test point goes to a logical 1 when the FTU sends a Cylinder Select signal (Tag 1) to the drive.

HEAD SELECT test point

This test point goes to a logical 1 when the FTU sends a Head Select signal (Tag 2) to the drive.

CONTROL SELECT test point

This test point goes to a logical 1 when the FTU sends a Control Select signal (Tag 3) to the drive.

OPERATION

GENERAL

The TB304 is used to pin-point a problem in the drive, once the nature of that problem has been defined. Suppose, for example, that a drive is suspected of intermittent Read errors. That's the nature of the problem. The TB304 can be set up to repeatedly write and read back any chosen data pattern on a given track, or on the entire pack, or on any portion of the pack between two selected cylinders, stopping when an error occurs.

By making several such error-stop passes, and by using the DISPLAY SELECT switch to identify the cylinder, head, character count, and the data pattern read for each error stop, the CE can create a record of error parameters that will provide a failure pattern for pin-pointing the problem.

The character-count display provides an indication of how far from Index the error occurred. If you suspect a bad spot on the disk because errors consistently occur for the same head (track) and cylinder, the character count can confirm it. If the character count is random for that situation, suspect intermittent data failures on the selected head, rather than a bad spot on the disk.

That is to say, the degree of flexing to which the head lead is subject at a particular head/arm location, plus machine vibration, might cause head/write errors; but they would most logically be random errors, not occurring at the same spot for every revolution of the disk. Discriminations between random errors and honest-to-goodness bad spots are important when writing the track format on a new scratch pack, as described under Operating Procedures.

Data and address errors are the most prevalent causes for failure. The TB304 provides Bypass switches for each of these errors. This allows the FTU to alternately write and read a suspected track (or cylinder or pack area) for an extended period without stopping when an error of this type appears. After the test, the Error Count display will show the number of errors that occurred during the test period, up to a maximum of 15.

PRELIMINARY SET-UP

1. Determine which of the following conditions will be required of the drive to be tested:

   a. The drive is to be tested for Read/Write, as well as Seek functions.

   b. The drive is to be powered up from the FTU.

   c. Only the access (Seek) functions of the drive are to be tested.

   d. The drive need not be powered up from the FTU.

   e. Head alignment (but no R/W) of the drive is to be performed.

   For conditions a or b, the A and B I/O cables from the controller must be disconnected from the drive and the I/O connections made between the drive and the FTU, via the A and B cables provided with the tester.

   For conditions c, d, or e, the I/O Bypass cable connection between the FTU and the drive to be tested will be sufficient. Of course, any of the five conditions may be realized by connecting as shown for conditions a or b.

2. Take steps to ensure that the system will not attempt to select the drive while that drive is being exercised by the FTU.

3. Remove ac power from the drive and make the I/O cable connections as determined in step 1. Do not reapply ac power to the drive.

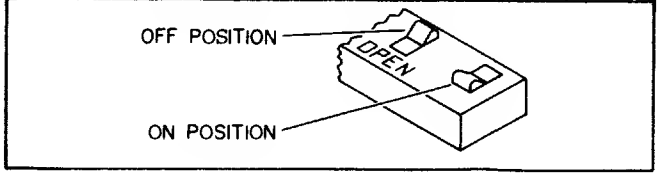
4. Set the Sector switches on the Field Test Unit according to table 2-3. The switches are located on a dual in-line package located in position A20 on the FTU logic board.

5. Set the following drive-oriented switches to the drive specifications:

   RPM HEADS
   TPI BPI

TABLE 2-3. SETTING SECTOR SWITCHES

No. of Sectors	Sector Switches							
	1	2	3	4	5	6	7	8
2	ON							
4	ON	ON						
8	ON	ON	ON					
16	ON	ON	ON	ON				
32	ON	ON	ON	ON	ON			
64	ON	ON	ON	ON	ON	ON		
128	ON	ON	ON	ON	ON	ON	ON	
256	ON	ON	ON	ON	ON	ON	ON	ON



6. Set the following switches as shown for normal testing:

Switch	Position
Servo Offset	center (off)
Data Strobe	center (normal)
Wrt Flag	down (off)
Xtal/Servo	SERVO
Maint/Nrm	NRM
Wrt Inhibit/Nrm	NRM
Addr Mk/Sect Mk	ADDR MK
Unit (4 switches)	to logical address of the drive
Addr Error/Bypass Data Error Bypass (2 switches)	both down (off)

7. Install a scratch pack on the drive to be tested.

8. Turn on the FTU.

9. Apply ac power to the drive.

10. Select the drive by placing the SEL/REL switch to SEL. The UNIT SELD indicators should light up, as will the WRT PROT indicator if the drive under test has the Write Protect Feature.

11. Power up the drive. The WRT PROT lamp, if on, will go out when the drive is up to speed. The UNIT READY lamp will light up when the heads are loaded.

12. Actuate the RTZ switch, then the RESET switch on the FTU panel.

    The drive is now ready for exercising. It has performed a Seek to cylinder zero and has selected head zero. The remaining switches on the FTU panel may now be set for the desired function and operating modes, as illustrated in Operating Procedures.

OPERATING PROCEDURES

The first five of the procedures described below embody every access, read/write, and head-select mode provided by the TB304. Procedure 6 checks the data error logic and Procedure 7 describes the use of the head alignment card.

Procedure 1: Continuous Seek, no R/W

(Perform alternate Seeks between the cylinder address in the CAR and the address set in the CYLINDER ADDRESS switches.)

1. Assure that the FTU switches are positioned as described in the Preliminary Set-up procedure. In addition, position the following switches as shown:

Switch	Position
Display Select	CYLINDER
Wrt-Rd Select	OFF

2. Set the CYLINDER ADDRESS switches to the value of one of the cylinder address to which the drive will seek. (For illustrations, choose CA 8.)

3. Set the ACCESS MODE switch to DIRECT.

4. Momentarily actuate the START switch. When the ON CYL indicator is lit, move the switch momentarily to STOP. Address 8 is now in the CAR, and will be displayed on the panel.

5. Set the CYLINDER ADDRESS switches to the value of the second cylinder address. (For illustration, choose CA16.)

6. Set the ACCESS MODE switch to CONT.

7. Actuate START.

   The drive will perform alternate Seeks between addresses 8 and 16. The ON CYL indicator will blink rapidly as the heads move on and off cylinder. The Cylinder Address display lights will alternate between 8 and 16.

8. Stop the FTU.

9. Actuate RTZ.

10. Start the FTU.

    The tone of the drive will change as it now seeks between cylinders 0 and 16. Observe the display.

11. To stop the operation, actuate either STOP or RESET.

Procedure 2: Rondom Seek, no R/W

1. Maintain the Preliminary Set-up switch positions. In addition, set the following switches as shown:

Switch	Position
Display Select	CYLINDER
Wrt-Rd Select	OFF
Access Mode	RAND

2. Actuate START.

3. Assure that cylinders are being selected randomly by observing the changing pattern on the display lamps.

4. Stop the FTU by actuating STOP or RESET.

NOTE

Procedure 3 through 6, following, require that the A and B I/O cables be connected between the FTU and the drive under test.

Procedure 3: Write Format

This procedure is used to write a prescribed format on every track of the disk pack. The next procedure, Read, determines whether any of the tracks so written contain errors. The final procedure, Write Flag, shows how to select a single track, write a "defective track" flag bit on that track, and check to ensure that the flag bit was indeed written. The track format is shown in figure 2-3.

1. Maintain the switch positions as given in the Preliminary Set-up procedure. In addition, set the following switches as shown:

Switch	Position
Display Select	READ DATA
Access Mode	SEQ FWD
Wrt-Rd Select	WRT FORMAT
Cylinder Address (8)	all down (off)
Seq/Man	SEQ
Head Address (6)	all down (off)
Data Pattern (8)	anything but "all zeros"

2. Move RTZ/RESET switch to RESET, then to RTZ.

3. Actuate START.

   Observe the progression of the display lights as the drive moves away from cylinder zero. (With the DISPLAY SELECT switch set to READ DATA, the cylinder address is displayed while the FTU is running.)

4. If an error stop occurs, remove the cause of the error by proceeding as indicated in the Trouble Analysis decision logic table on page 2-17. (Data errors will not occur during WRT FORMAT.) Then proceed as follows:

   a. Actuate RESET to clear the error indication in the FTU.

   b. Actuate START. This rewrites the track that was selected when the error occurred, then continues the Write Format operation.

   c. Do not actuate RTZ. To do so would cause the operation to begin anew at cylinder zero, head zero.

5. After all tracks have been written, stop the FTU. (Writing will begin again at cylinder zero, so the actual stopping point is immaterial.)

Procedure 4: Read

This operation tests the entire data pack for errors, using the Sequential Reverse Access mode.

1. Set the following switches as shown. All others should remain as given for the Write Format procedure.

Switch	Position
Display Select	CYLINDER
Access Mode	SEQ REV
Wrt-Rd Select	RD

2. Set the CYLINDER ADDRESS switches to the maximum cylinder address of the drive under test.

3. Actuate START.

   Reading will begin at maximum cylinder, head zero. Should an error occur, the RUN light will go out and the panel lamps will display the type of error, as well as the cylinder that was being read when the error occurred. Follow steps 4 and 5 for each separate error stop. If no errors, skip to step 6.

4. Record the error parameters, moving the DISPLAY SELECT switch as needed.

   NOTE

   It is not necessary to record the ERROR COUNT. This will remain at count 1 for any stop-on-error operation.

5. After the error parameters have been recorded, actuate RESET to clear the error indication in the FTU, then actuate START to continue reading.

6. When the FTU begins reading again at the maximum cylinder address, actuate STOP to halt the FTU.

Procedure 5: Write Flag

The above Read procedure allows for reading each track of the scratch pack but one time. A single read may well produce random errors that in an on-line environment would be eliminated by the system's error-recovery program. Before flagging a track as bad -- that is, as one that continually produces errors that are

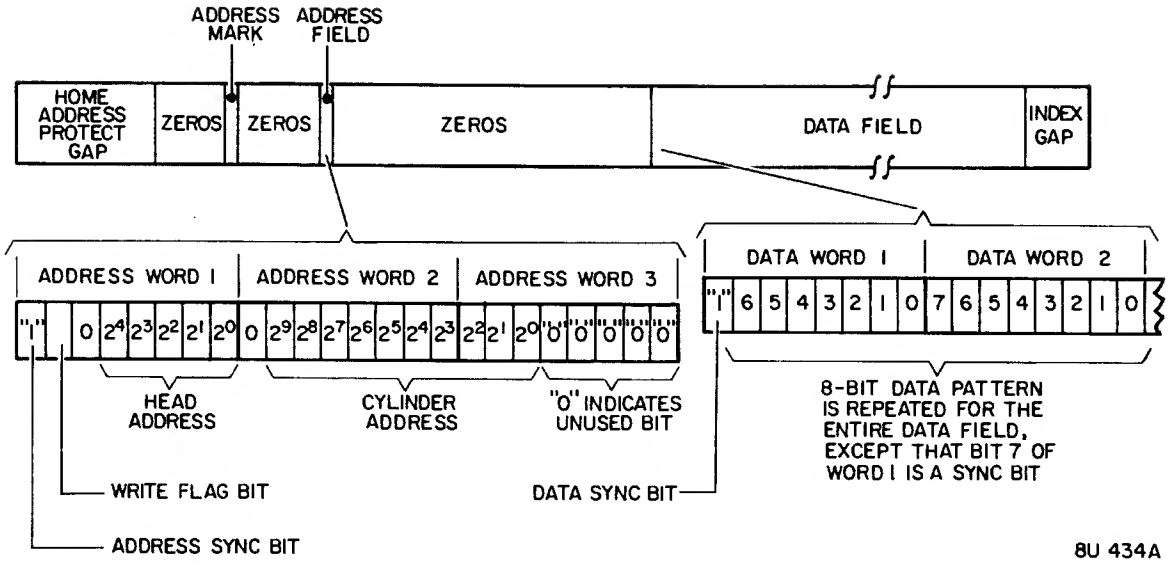


Figure 2-3. Track Format

not recoverable -- it is best to WRT•RD the track several times. If the error persists, the Trouble Analysis procedure (see Procedure 7) should be executed in an effort to recover the error. Only after both of these attempts have failed, should the track be flagged.

This procedure writes a "defective track" flag bit in Bit 6 of Address Word 1 (see figure 2-3).

1. Set the following FTU switches as indicated. Other switches should remain as shown for the Preliminary Set-up procedure.

Switch	Position
Wrt Flag	up (on)
Display Select	READ DATA
Access Mode	DIRECT
Wrt-Rd Select	WRT FORMAT
Data Pattern (8)	as set when the track was most recently written.
Cylinder Address (11)	to select the track
Head Address (6)	to be flagged
Seq-Man	MAN

2. Actuate RESET, then START.

   Drive will seek to the selected track.

3. When ON CYL light comes on, wait about 1/2 second and then actuate STOP.

4. Set WRT-RD SELECT switch to RD.

5. Actuate START.

   The "defective track" flag bit will prohibit reading the track. The ADDRESS ERROR and DATA ERROR lights should not light up.

6. Actuate STOP.

   Repeat steps 1 through 6 for each track to be flagged as defective.

NOTE

The WRT FLAG switch must be turned off before reading a track that has not been written as defective, otherwise an address error will occur.

Procedure 6: Check Data-Error Logic

This procedure assures the operator that data errors will be recognized by the FTU. It is used when the FTU is exercising a drive in any situation where data errors are expected -- an intermittent Read failure, for example -- but none occur. It assumes that the procedure in question is still running and that the scratch pack therefore has a data field written on the tracks being tested.

1. Stop the FTU.

2. Set the following FTU switches as indicated:

Switch	Position
Wrt-Rd Select	RD
Data Error Bypass	down (off)
Data Pattern	Choose any one switch and move it to the opposite position. (Move just one!)

All other switches must remain as they were at the start of the procedure being questioned.

3. Start the FTU.

The FTU should stop with the DATA ERROR indicator lit.

4. Actuate RESET to clear the error indication.

5. Set the DATA ERROR BYPASS switch up (on).

6. Actuate START.

The FTU should run without stopping on an error, but the Rd/Wrt Error counter will count the errors (up to 15).

7. Stop the FTU. Return all switches used during this procedure to the state they were in at the start of the procedure being questioned.

Procedure 7: Trouble Analysis

Table 2-4 is a decision logic table (DLT). It shows the procedures the operator should take to eliminate any error that might occur when using the FTU to exercise a drive. Address and Data errors will, of course, occur only during one of the Read or Write modes. Others may occur for either Read/Write or Access Only (no R/W) modes. It should be noted that a Sector Mark error is not indicated if the Address Error Bypass switch is active.

Basically, the DLT deals with attempts either to eliminate or to recover data and address errors before writing a "defective track" flag on the track in error. This involves trying various Offset and Data Strobe switch combinations.

The DLT is divided into four quadrants. Each test condition (shown in the upper left quadrant) is reduced to a Yes (Y) or No (N) result, as indicated in numbered columns of the upper right quadrant, two columns being allotted for each test condition. The two lower quadrants deal with recommended actions.

To determine what actions (if any) should be executed for a given test result, follow the selected column down to the number "1" (first recommended action) in the lower right quadrant. The specific action to be taken is then located by following across to the lower left (Actions) quadrant. After Action 1 has been taken, repeat the test that gave rise to the error condition. If the error persists, perform Action 2, test again, and so on. An "X" in the lower right quadrant indicates a "no error" or a "problem solved" situation, and requires no further remedial action.

Columns 9 through 19 (sheets 2 and 3 of table 2-4) define the sequential tests that were alluded to in the second paragraph of this procedure, and which should be made in an attempt to recover any data error. Note that the last Action item in any of these "yes" (even-numbered) columns instructs the operator to set up the next condition, or test, for re-reading the track in error. When the last of these sequential tests has failed to recover the data, then and only then should the Write Flag procedure be carried out as indicated by Action 3 of column 19.

Procedure 8: Using the Head Alignment Card *

This procedure describes the use of the type HFSV Head Alignment card and the null meter on the FTU control panel to perform R/W- and/or servo-head alignment on the SMD under test. The procedure may be implemented using either the A and B cables or the I/O Bypass cable. The cabling involved is seen in figure 2-1, and table 2-2 gives specific connection information. The switches and indicators on the HFSV card are shown in figure 2-4.

This procedure assumes that the I/O connections between the drive and the FTU have already been made as described in the Installation portion of this manual. The installation and cabling of the Head Alignment card, as detailed in table 2-2, must be made with ac power removed from the drive and the FTU.

1. Install the proper CE pack on the drive to be tested.

2. Install the HFSV card in the drive's logic chassis at the location specified in table 2-2 for the type of drive under test.

3. Install the Head Alignment cable between the drive's logic chassis and the jack on the card in the R/W chassis, as specified in table 2-2. Note that P104 is keyed so that it will fit on the R/W card only one way.

4. Connect the test leads, provided with the FTU, between the HFSV card and the null meter on the FTU panel. Observe polarity.

5. Set the WRT INHIBIT/NRM switch on the FTU to WRT INHIBIT.

6. Apply ac power to the drive. The POWER lamp on the HFSV card should light up.

* TB304A/B only.

7. Power-up the drive.

8. Assure that S3 on the HFSV card is set to X1 (no attenuation of output), and that S2 is set as required for the first head, Servo (S) or Data (RW), to be checked for alignment.

9. Turn on the FTU.

   If the drive under test has the Write Protect feature, the WRT PROT light on the FTU Panel will be lit.

10. When the drive is up to speed and the READY light on the FTU panel is lit, actuate RESET, then RTZ.

Carry on as detailed by the head alignment procedure in the maintenance manual for the drive under test. When the heads have been aligned, remove the CE pack from the drive. Install the scratch pack if further tests are to be conducted using the FTU.

Installing the Head Alignment card automatically "write protects" the drive. (This is true even if the drive does not have the Write Protect feature, which merely allows Write Protect to be implemented from the drive's operator panel, and in addition provides the Write Protect signal in the I/O lines.) Therefore, if Write, Write then Read, or Write Format operations are to be conducted, the HFSV card must first be removed from the drive.

TABLE 2-4. TROUBLE ANALYSIS, SHEET 1 OF 3

Assume: 1. A & B I/O cables connected between drive and FTU. 2. Power applied to FTU and drive. 3. ±5V indicators on FTU panel are lit. 4. DATA/ADDRESS BYPASS switches OFF. 5. FTU set to READ track format. 6. READ indicator comes on when START switch (on FTU panel) is actuated.							
Conditions:	1	2	3	4	5	6	7
Seek error.	N	Y	-	-	-	-	-
Clock error in SERVO position.	N	-	Y	-	-	-	-
Clock error in XTAL position.	-	-	-	N	Y	-	-
Sector Mark error	N	-	-	-	-	Y	-
Drive Fault	N	-	-	-	-	-	Y
Actions:							
Go to sheet 2 Conditions.	1	-	-	-	-	-	-
Actuate RESET, RTZ, START	-	1	-	-	-	-	-
Refer to drive maintenance manual	-	2	-	-	-	4	1
Set XTAL-SERVO switch to XTAL; Actuate RESET, START	-	-	1	-	-	-	-
Check TP5 (WRITECLK) on FTU panel.	-	-	-	-	1	-	-
Refer to FTU diagrams.	-	-	-	-	2	3	-
Check B-cable for Servo Clk signal. Troubleshoot discontinuity in drive, cable, FTU.	-	-	-	1	-	-	-
Check that sector switches in FTU and drive are set correctly	-	-	-	-	-	1	-
Check TP1 (SECTOR MK) on FTU panel.	-	-	-	-	-	2	-

UPPER LEFT QUADRANT: Assumptions needed for tests, as well as the test conditions.

UPPER RIGHT QUADRANT: Results of the test. N = No; Y = Yes; - = don't care.

LOWER LEFT QUADRANT: Actions to be taken for each test result.

LOWER RIGHT QUADRANT: Numbers show sequence of actions for the test results in a given column. After each Action, the test is repeated and, if needed, the next Action is taken.
X = a "no error" or "problem solved" situation.

TABLE 2-4. (CONT'D) TROUBLE ANALYSIS, SHEET 2 OF 3

Conditions (cont'd):	1	8	9	10	11	12	13	14	15	16	17	18	19
Address error	N	Y	-	-	-	-	-	-	-	-	-	-	-
Data error, OFFSET and DATA STROBE switches in center-off position	N	-	Y	-	-	-	-	-	-	-	-	-	-
Data error on WRT•RD retry	-	-	-	N	Y	-	-	-	-	-	-	-	-
Data error, OFFSET switch in + (FWD) position	-	-	-	-	-	N	Y	-	-	-	-	-	-
Data error, OFFSET switch in - (REV) position	-	-	-	-	-	-	-	N	Y	-	-	-	-
Data error, DATA STROBE switch set EARLY	-	-	-	-	-	-	-	-	-	N	Y	-	-
Data error, DATA STROBE switch set LATE	-	-	-	-	-	-	-	-	-	-	-	N	Y
Actions:													
Track was read without error	X	-	-	-	-	-	-	-	-	-	-	-	-
Perform WRT FORMAT for track in error; READ re-written track.	-	1	-	-	-	-	-	-	-	-	-	-	-
Perform WRT•RD retry as follows: (Set FTU switches as indicated below) WRT-RD SELECT to WRT•RD ACCESS MODE to DIRECT SEQ/MAN to MAN HD ADRS, CYL ADRS } to select failing track Actuate START; check for conditions 10 or 11	-	-	1	-	-	-	-	-	-	-	-	-	-
Drive has demonstrated its ability to recover data.	-	-	-	X	-	X	-	X	-	X	-	X	-
Unrecoverable error. Perform WRT FLAG procedure for track in error.	-	2	-	-	-	-	-	-	-	-	-	-	-

TABLE 2-4. (CONT'D) TROUBLE ANALYSIS, SHEET 3 OF 3

Actions (cont'd)	1	8	9	10	11	12	13	14	15	16	17	18	19
Set OFFSET switch to + (FWD) position; READ track in error.	-	-	-	-	1	-	-	-	-	-	-	-	-
① Check Bit 2 TP on FTU panel; if missing, refer to FTU Diagrams.	-	-	-	-	-	-	1	-	-	-	-	-	-
① Check BOB2 in drive; if missing, check I/O cable and Fwd Offset logic in drive.	-	-	-	-	-	-	2	-	-	-	-	-	-
Set OFFSET switch to - (REV) position; READ track in error.	-	-	-	-	-	-	3	-	-	-	-	-	-
① Check Bit 3 TP on FTU panel; if missing, refer to FTU Diagrams.	-	-	-	-	-	-	-	-	1	-	-	-	-
① Check BOB3 in drive; if missing, check I/O cable and Rev Offset logic in drive.	-	-	-	-	-	-	-	-	2	-	-	-	-
Return OFFSET switch to center-off; set DATA STROBE switch to EARLY. READ track in error	-	-	-	-	-	-	-	-	3	-	-	-	-
① Check Bit 7 TP on FTU panel; if missing, refer to FTU Diagrams.	-	-	-	-	-	-	-	-	-	-	1	-	-
① Check BOB7 in drive; if missing, check I/O cable and Early Strobe logic in drive.	-	-	-	-	-	-	-	-	-	-	2	-	-
Set DATA STROBE switch to LATE; READ track in error.	-	-	-	-	-	-	-	-	-	-	3	-	-
① Check Bit 8 TP on FTU panel; if missing, refer to FTU Diagrams	-	-	-	-	-	-	-	-	-	-	-	-	1
① Check BOB8 in drive; if missing, check I/O cable and Late Strobe logic in drive.	-	-	-	-	-	-	-	-	-	-	-	-	2
Unrecoverable error. Perform WRT FLAG procedure for track in error.	-	-	-	-	-	-	-	-	-	-	-	-	3

① When checking for the presence of these bits, the DATA ERROR BYPASS switch must be on ("up" position). This allows reading to continue in the event of an error. The switch should be off ("down" position) when checking for the conditions.

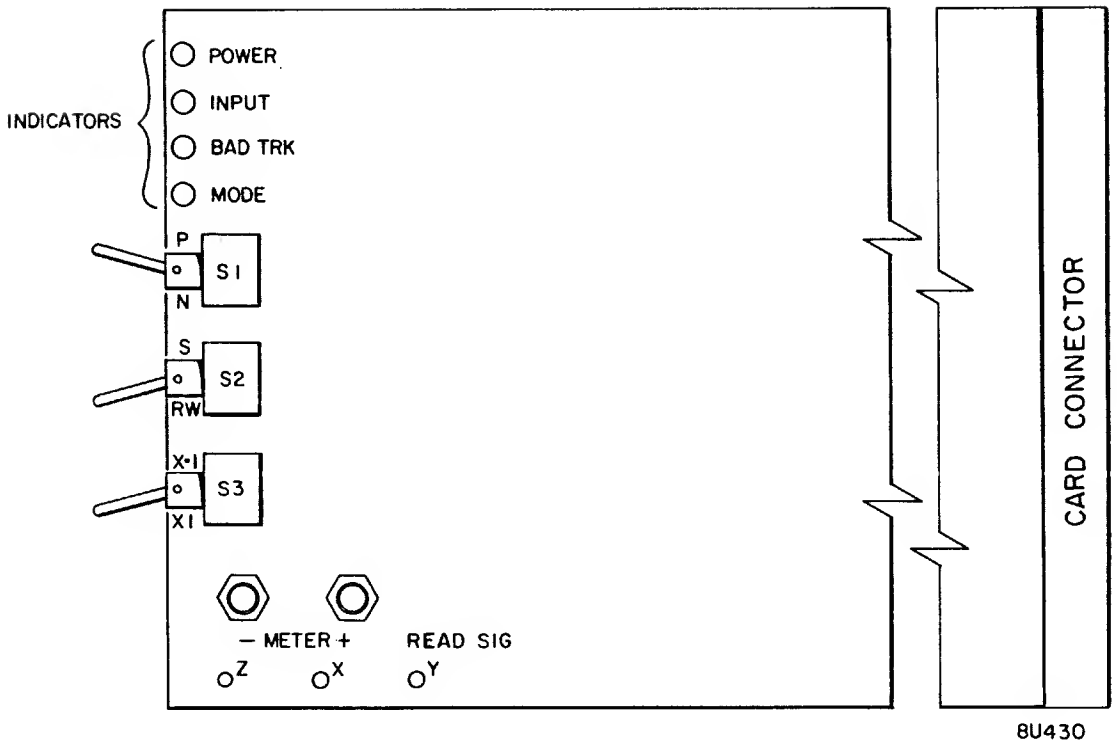


Figure 2-4. Head Alignment Card

Indicators

POWER — Lit when power is applied to the card.

INPUT — When lit, indicates that input signals are too low for HFSV to operate.

BAD TRK — When lit, indicates a short duration loss of input. A one-shot keeps the LED lit for at least 4 seconds. The lamp will light when S1 is toggled.

MODE — Lit when S2 is in the S (Servo) position or when S3 is set to X.1. When either of these conditions exists, read/write head alignment error cannot be measured.

Switches

S1 — Changes the polarity of the alignment signal to the null meter. P = positive, N = negative. Algebraically subtract P from N to determine alignment error: P = +30 mV, N = -40 mV; Error = 70 mV.

S2 — "S" position selects Servo head as input to HFSV. "RW" position selects a data head as input to HFSV.

S3 — Changes sensitivity of HFSV. "X•1" position attenuates card output by a factor of 10, and alignment error cannot be accurately measured. "X1" position does not attenuate HFSV output; alignment error can be accurately measured.

SECTION 3

THEORY OF OPERATION

INTRODUCTION

The major portion of this section consists of flowcharts that describe the logic sequencing of each access and read/write mode. In the flowcharts, 3-digit numbers above each symbol show the cross-reference number in the Diagrams section where the element named within the symbol may be found. When it is helpful to show these references in the supporting text, the cross-reference number is preceded by the letters CR, and the entire reference enclosed in parentheses. Thus, (CR 117) refers to the diagram that has 117 in the CROSS REF NO rectangle of the title block.

A functional block diagram of the FTU logic circuits is presented in figure 3-1.

I/O LINES

Table 3-1 defines the I/O signals on the A and B cables. An asterisk after a signal name means that the signal is also present in the I/O Bypass cable.

TABLE 3-1. I/O LINES

Signal Name	Function		
	"A" CABLE (TO DRIVE)		
Tag Bus Lines	Four lines that define the operation to be performed by the drive. The Unit Select Tag gates the four Unit Select lines to the drive. Tag 1 gates the cylinder address and initiates the seek. Tag 2 gates the head address. Tag 3 is the control select that gates the function to be performed.		
Bus Out Lines	Tag 1*	Tag 2*	Tag 3*
Bit 0*	1	1	Write Gate - Enables write circuits in drive, unless drive is write protected.
Bit 1*	2	2	Read Gate - Enables read circuits in drive.
Bit 2*	4	4	Servo Offset Plus - Offsets the actuator from the nominal on cylinder position toward the spindle.
Bit 3*	8	8	Servo Offset Minus - Offsets the actuator from the nominal on cylinder position away from the spindle.
Bit 4*	16	16	Fault Clear - Pulse to clear the Fault Summary flip-flop in the drive.
Bit 5*	32	-	Address Mark Enable - When combined with a Write Gate, Address Mark is written. When combined with a Read Gate, an Address Mark search is initiated.
Bit 6*	64	-	RTZ - Pulse that causes the drive actuator to seek to track zero.
Bit 7*	128	-	Data Strobe Early - Enables the drive's PLO data separator to strobe the data at a time earlier than optimum.

Table continued on next page

TABLE 3-1. I/O LINES (Contd)

Signal Name	Function		
	"A" CABLE (TO DRIVE)		
Bus Out Lines	Tag 1	Tag 2	Tag 3
Bit 8*	256	-	Data Strobe Late - Enables the drive's PLO data separator to strobe the data at a time later than optimum.
Bit 9*	512	-	Release - Pulse sent to drive to clear the Channel Reserved flip-flop. Applicable only to dual-access drives.
Unit Select Lines	Four lines used to select the drive. The binary code on the lines must match the code on the logic plug in the drive.		
Sequence Power	Allows the FTU to power up the drive if the drive is in Remote mode.		
	"A" CABLE (FROM DRIVE)		
Sector Mark ①	Signal derived from the servo track. The FTU will check a maximum of 128 sector marks per revolution.		
Fault	Indicates that one or more of these faults exist in the drive: DC power fault, head select fault, write fault, write or read while off cylinder, and Write Gate during a Read operation.		
Seek Error	Indicates that the unit was unable to complete a move within 500 ms, or that carriage has moved to a position outside recording field.		
On Cylinder*	Indicates that the servo has positioned the heads over a data track.		
Index* ①	Provides a point of reference to begin R/W operations after On Cylinder has been detected.		
Unit Ready	Indicates that selected unit is up to speed, heads are loaded, and no fault exists.		
Open Cable Detector	Inhibits Unit Selection and any unwanted command such as Write Gate when "A" cable is disconnected or controller power is lost.		
Address Mark Found*	Indicates that an Address Mark has been found.		
Write Protected	Indicates that the drive is in the Write Protect state if the drive has the Write Protect option.		
	"B" CABLE (TO DRIVE)		
Write Data	Carries NRZ data to be recorded on disk pack.		
Write Clock	Transmits the Write Clock signal.		
	"B" CABLE (FROM DRIVE)		
Servo Clock*	Phase-locked 9.677 MHz clock generated from the servo track dibits.		
Read Data	Carries NRZ data recovered from the disk pack.		

Table continued on next page

TABLE 3-1. I/O LINES (Contd)

Signal Name	Function
	"B" CABLE (FROM DRIVE)
Read Clock	Signal that is synchronous with the detected NRZ data.
Seek End	Seek End indicates that a Seek operation has terminated.
Unit Selected	When the four unit select bit lines compare with the logic plug on the control panel, and when the unit select line is true, then the Unit Selected line is true.
*	Indicates that the signal is also carried by the I/O Bypass cable.
①	In some drives, this signal is in the B-cable instead of the A-cable.

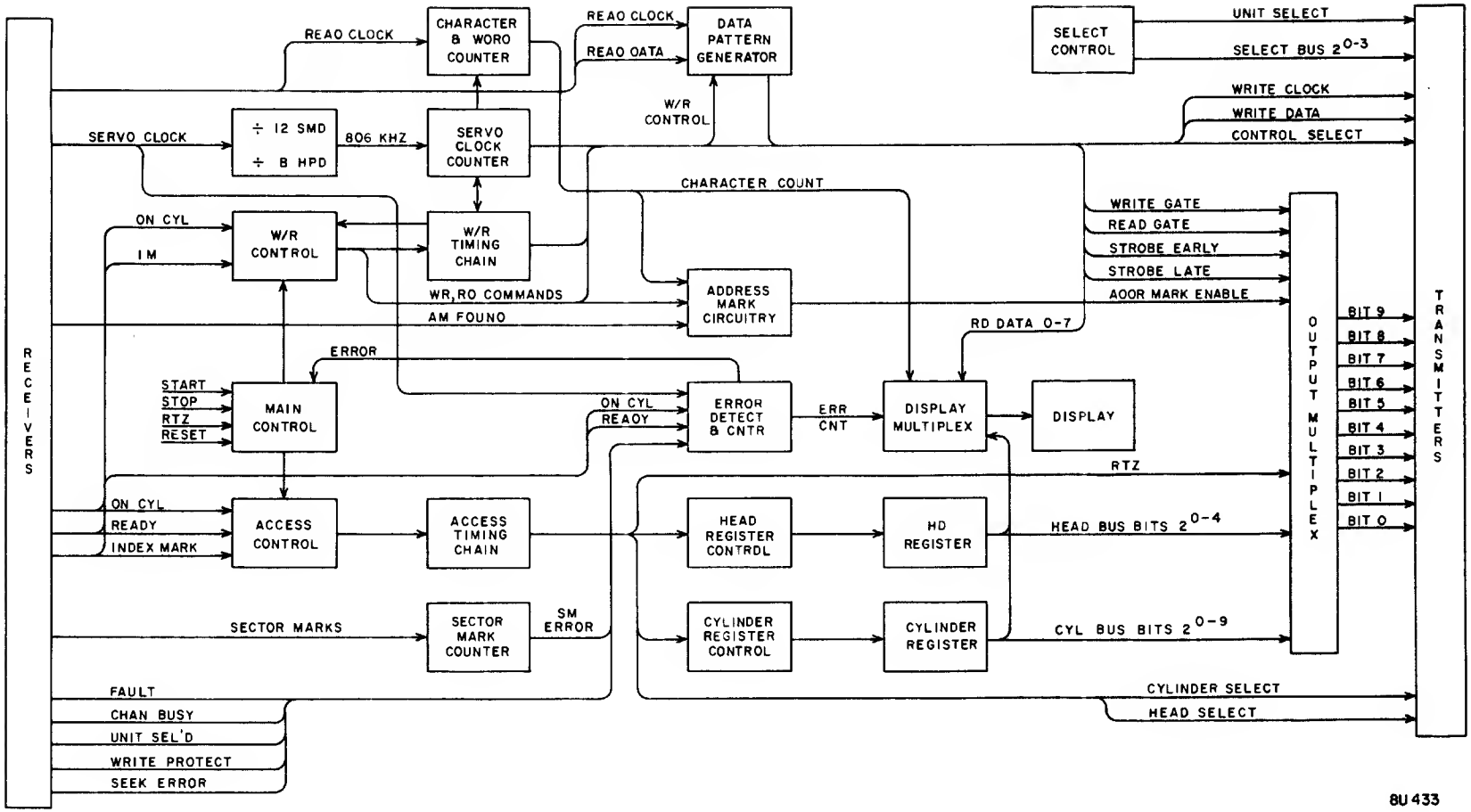


Figure 3-1. TB304 Block Diagram

SALIENT LOGIC ELEMENTS

Table 3-2 describes the purpose of flip-flops and registers that may not be obvious at first glance, or that are not explained elsewhere in the test. The table is arranged by CR number for convenience when using the logic diagrams.

TABLE 3-2. SALIENT LOGIC ELEMENTS

CR. No.	Element	Purpose
102	Last Access FF	Sets to indicate that a R/W operation is to follow the Seek operation now being performed.
103	Alternate FF	Used during Continuous seeks to determine whether the CAR or the Cylinder Address switches will serve as input to the drive via the Cylinder Address mux.
103	Clocked Not On Cyl FF	Enables incrementing of cyl address during Random mode. Cleared by On Cyl Detected signal to hald incrementing.
105	Sel Fixed Hd FF	Set whenever Fixed Heads AND MMD are selected from FTU panel. Cleared when either SMD or MOVABLE switch positions are selected. Toggled by + Clr Cyl signal. (See Fixed Head Operation.)
106	Hd Adrs Comparator	Compares current head address (in HAR) with maximum head address for drive under test, depending upon position of panel switches as shown below. FIXED/BOTH/MOVABLE — DRIVE — HEADS — Max Hd No MOV/BOTH • — ( ) • — (LO) — 1 MOV/BOTH • — ( ) • — (HI) — 3 not applicable — SMD • — 5 — 4 not applicable — SMD • — 19 — 18 FIXED • — ( ) — X — 3 (See Fixed Head Operation.)
107	Offset Mode FF	Indicates Fwd or Rev (+,-) offset during Offset Operations.
	Not Offset I FF	Set when FTU is stopped, or if Offset is not in effect. Cleared at T3, or at the end of Or Cylinder Lockout delay if Offset is programmed.
	Not Offset II FF	Set at T3, cleared for Offset operation or during Maintenance mode.
108	Wrt Then Rd FF	A forced clear is maintained on this FF except for WRT•RD or Offset operations. When the clear is released, the FF is toggled by each IM.* This means that reading is done on every second disk revolution, and that a new head won't be selected until the second revolution (Read phase of WRT•RD) has been completed.
	Last Rd/Wrt FF	Set is a R/W operation is not to follow a Seek sequence, or if the current R/W is using the highest-numbered head, or if Manual head select mode is active, or if in the Random mode with Sequential head selection. Also set for an error.
108	Rd/Wrt Enable FF	Set by the Index Mark following the appearance of ON CYL if a R/W operation is to follow the Seek sequence. Cleared by Index Mark if the current R/W operation is the last before seeking to a new cylinder (Last Rd/Wrt FF set).
	Rd Adrs Enable FF	Set at Index time for all R/W operations except Write Format to allow the FTU to sense the sync bit at the start of the address field and to read the address field. Cleared after the address field has been read (or at Index time for a Write Format sequence).

* Index Mark

(Table continued on next page)

TABLE 3-2. SALIENT LOGIC ELEMENTS (Contd)

CR. No.	Element	Purpose
109	Write Start FF	Enables the writing of Address Mark (AM) during a Write Format sequence. Allows writing the data field during Write (including Write Format) operations. Enables the setting of the Rd Start FF.
	Rd Start FF	Enables reading the AM for all R/W operations except Write Format. Enables the setting of the Rd Sync Start FF.
	Rd Sync Start FF	Enables sensing the sync bits and comparing the words for both address and data fields.
	Wrt Sync Start FF	Enables writing the data sync bit and data for a Write sequence, or writing the address/data sync bits and the address/data fields for a Write Format sequence.
	Sync Check FF	Cleared by the setting of Rd Sync Start FF, set when the address (or data) sync bit has been detected. If not set, the FF causes an Address (or Data) Error.
110	Wrt Gate Signal	Raises the Write Gate line to the drive (CR 120) via TAG 3 (control select).
	Read Gate Signal	Raises the Read Gate line to the drive.
110	Rd Compare Enable Signal	Permits comparing the address and data fields against the contents of the Word Mux (q.v.).
111	Wrt Sync/Found Sync FF	Set when either sync bit has been written (Write) or detected (Read). When set for either sync bit, enables the bit Counter.
	Write AM FF	Set during Write Format (only) to write the AM if the Address Mark switch is active. Gates the Address Mark Enable signal to the drive (CR 120) via TAG 3.
	Search AM FF	Set during all R/W operations except Write Format to initiate a search for address mark (Addr Mk Enable) when Read Gate signal is true and the Address Mark switch is active.
112	Adrs Not Complete FF	Set by Index Mark Gated (IM AND no error). Cleared at end of Address field.
	Not End Adrs Field FF	Set early on in the R/W cycle, this FF is cleared by the clearing of Adrs Not Complete FF to indicate the end of the Adress field. When cleared, it causes the Read and Write Reset signals that clear the R/W control FFs on CR 109.
	Word Cntr	Active for the address field only to gate Address Words 1, 2, and 3 to the Word Mux. At end of address field, the counter sits at the count of 3 until cleared by IM Gated. That count permits the data words to be written or compared, depending upon whether Rd Gate or Wrt Gate is active.
112	Read Word Cnt Increment FF	Set when - Bit Cnt 4 goes high (at Bit Count 0) if Rd Gate is true. Prevents incrementing the Word Counter when the Bit Counter is loaded with 7 (Bit Cnt 4 high) upon the detection of the sync bit. (Refer to C.R. 111.)
113	Word Mux	Controlled by the Word Cntr (WC). Determines what is transferred to the Pattern register (q.v.) during Write operations or to the Word Comparator (q.v.) during Read operations:

(Table continued on next page)

TABLE 3-2. SALIENT LOGIC ELEMENTS (Contd)

<table>
<tr><th>CR. No.</th><th>Element</th><th>Purpose</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>WC=</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Gates contents of</td><td>HAR

Addr Wd 1</td><td>Cyl Addr Mux

Addr Wd 2</td><td>not used

Addr Wd 3</td><td>Data Pattern Sw.

Data Wds</td></tr>
</table>
</td></tr>
<tr><td></td><td>Data Sync Bit FF</td><td>Set by IM Gated, but has no effect until WC=3. Causes Bit 7 of Data Word 1 to be a 1, regardless of the value of the Bit 7 Data Pattern switch. (Bit 7 of Data Word 1 is the Data Sync bit.) The next Increment Word Count signal finds the FF's CD input low, and clears the FF. This ensures that the true value of the Bit 7 Data Pattern switch will be transferred to the Word Mux for all words after Data Word 1.</td></tr>
<tr><td>114</td><td>Pattern Reg.</td><td>An 8-bit shift register with parallel and serial inputs and outputs, as follows:

Write: Parallel inputs (from Word Mux), serial output (to NRZ Write Data FF).

Read: Serial input (from drive), parallel outputs (to Word Comparator).</td></tr>
<tr><td>114</td><td>NRZ Write Data FF</td><td>When cleared, will send zeros to the drive if Write Gate is high, thereby causing the drive to write the zero fields (see track format, figure 2-3). When the preclear (reset) input goes high, the FF is clocked by Clock Data pulses (servo clock signals from the drive) and either sets or clears, depending upon the state of the serial output stage in the Pattern register.</td></tr>
<tr><td>115</td><td>Word Comparator</td><td>Active only during Read operation. Compares the serial information received form the drive, as seen in the Pattern register, against the Address or Data words, depending upon the input presented to the Word Mux. A faulty compare will cause the + Compare line to go low. If the Defective Track flag bit is present in the Address field, the Wrt Flag Detected FF will set, setting the Defective Sector FF to force + Compare high for that track. When not actually comparing, + Compare is held high (Rd Compare Enable is low) to avoid irrelevant data/address error indications.</td></tr>
<tr><td>120</td><td>Bus Out Mux</td><td>Delivers TAG information to the drive via the A-cable transmitters (CR 123, 124) or the I/O Bypass cable (CR 403):
<table>
<tr><th>Input Selected</th><th>0</th><th>1</th><th>2</th><th>3</th></tr>
<tr><td>Output</td><td>(TAG 1) Cyl Addr</td><td>(TAG 2) Head Addr</td><td>(TAG 3) Control Select</td><td>Not Used</td></tr>
</table>
</td></tr>
</table>

ACCESS (SEEK) MODES

GENERAL

A Seek operation begins by setting the Access Enable FF (CR 102). This is done manually by actuating the START switch to provide the Start Access signal, or automatically by the FTU logic when the read/write sequence (if any) for the previous Seek operation has been completed.

Four elements provide the timing for the access modes.

1. Servo Clock Counter (CR 118). A hexadecimal counter that counts the servo pulses from the disk (repetition rate = 9.667 MHz). It is basically a Divide by 8 or Divide by 12 counter, controlled by the speed of the drive under test. For 2400 rev/min drives, the counter divides by 8; for 3600 rev/min drives, it divides by 12.
2. Character Counter (CR 118). A 15-stage counter that is loaded with the count of 1 for each index mark (disk revolution), providing an error has not occurred during the preceding revolution. When an error appears the counter is disabled, allowing the character count at the time of the error to be displayed.
3. Access Timing Counter (CR 103). A hexadecimal counter that is operational whenever a Seek is to be performed. The counter advances each time bit 2^1 of the Character Counter goes from high to low.
4. Access Timing Decoder (CR 103). This decimal decoder provides T-pulses (T0 through T7) from the encoded outputs of the Access Timing Counter. Table 3-3 describes how the T-pulses are used by the FTU.

TABLE 3-3. ACCESS TIMING FUNCTIONS

Count	C.R. No.	Function Provided	Operational During
T0	120	1. Raises Tag 2 (Head Select) to drive so as to transmit head address during any access sequence.	All R/W
	120	2. Pseudo T0 that transmits contents of HAR to drive for each R/W disk revolution after the first (ON CYL) revolution.	All R/W
T1	104	1. Loads Cyl Addr Reg with contents of Cyl Addr switches if CAR=0.	Seq Rev seek
	104	2. Increments CAR.	Seq Fwd or Random seek
	103	3. Toggles Alternate FF.	Continuous seek
T2	104	1. Load CAR with contents of Cyl Addr switches.	Direct seek
	106	2. Clear HAR unless Manual Hd Sel mode.	All R/W
T2.5	105	3. Load Cyl Addr Mux with contents of CAR.	All seeks
	106	4. Decrease count in CAR (trailing edge)	Seq Rev seek
T3	123	1. Gate Cyl Addr to drive (Tag 1)	All seeks
	107	2. Set Not Offset II FF	Seek with Offset
	102	3. Set Last Access FF if R/W follows.	All seeks
	107	4. Clear Not Offset I FF	Seek without Offset
T4	106	1. Load HAR with contents of head address switches if in Manual head select mode.	All R/W
T5 T6		Not Used	
T7	102	Clear Access Enable FF (See Seek flowcharts for specific actions that occur between T7 and the start of a R/W operation.)	All seeks
	107	Clear Not Offset II FF to initiate On Cylinder Delay	Maintenance Mode

SEQUENTIAL REVERSE (SEQ REV) SEEK

Figure 3-2 shows the Sequential Reverse Seek flowchart.

After setting all switches for the desired operation, RTZ must be actuated in order to clear the Cylinder Address Register (CAR) so that the contents of the Cylinder Address switches can be loaded into CAR at T1 of each "first seek" excursion of the Access Timing Counter. The Cylinder Address switches must contain a valid address for the device being tested or a Seek error will result.

For Sequential Reverse seeks, CAR counts down; for other operations (except Direct Seek), it counts up. An On Cylinder signal is returned by the drive after T7. Any error will reset the Run FF and Start Access delay (one-shot) to prevent further seeks.

When doing seeks only (no intervening R/W operations), Access Enable is cleared at T7, but is set again as soon as the T7 pulse disappears. (See the -T7 input to the 4-way NAND controlling the clock input to Access Enable -- cross reference 102). This permits uninterrupted seeks until a Stop, Reset, or Error condition occurs.

For any R/W operation, the Last Access FF is set at T3. This says that a R/W operation must be completed before another seek operation can be initiated. A R/W operation begins by setting the Rd/Wrt Enable FF as soon as an Index Mark is detected after the drive is On Cylinder. The leading edge of Index Mark then forces a pseudo T0 pulse that gates the contents of HAR (head address register) to the drive. The leading edge of each succeeding index mark increases the count in HAR (except for Manual head selection, shown below), and the trailing edge gates the address.

When HAR reaches maximum, the Last Rd/Wrt FF is set. This clears the Rd/Wrt Enable FF at the end of the current R/W cycle, which is signalled by the next appearance of Index Mark. With the Last Access FF cleared, as it was at the start of the R/W operation, and provided that no error stops have occurred, Access Enable again sets to initiate another seek.

For manual head selection mode, the Last Rd/Wrt FF remains set. This means that the selected track is read (written) once. The ensuing index mark then causes another seek to be initiated.

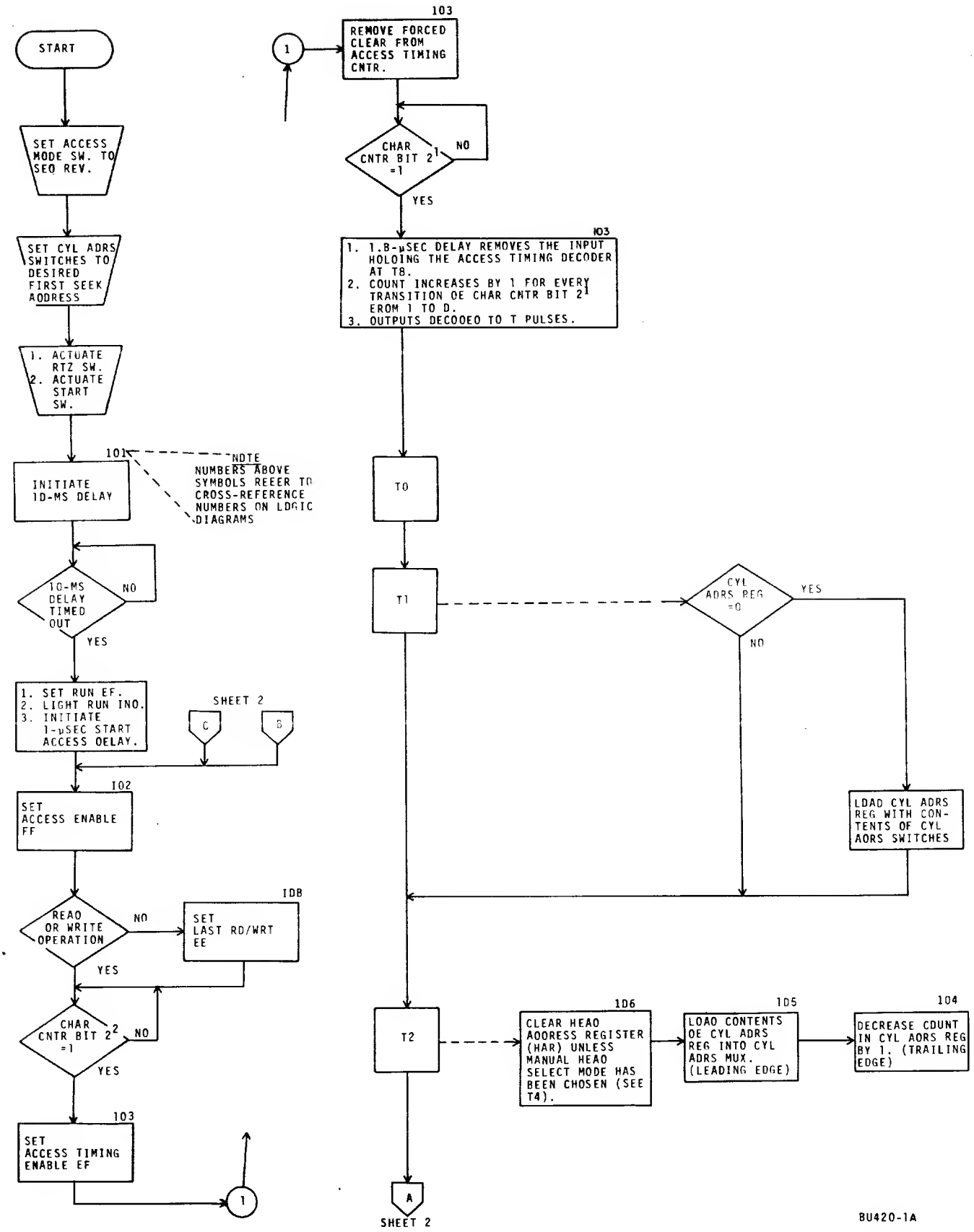


Figure 3-2. Sequential Reverse Seek Flowchart (Sheet 1 of 2)

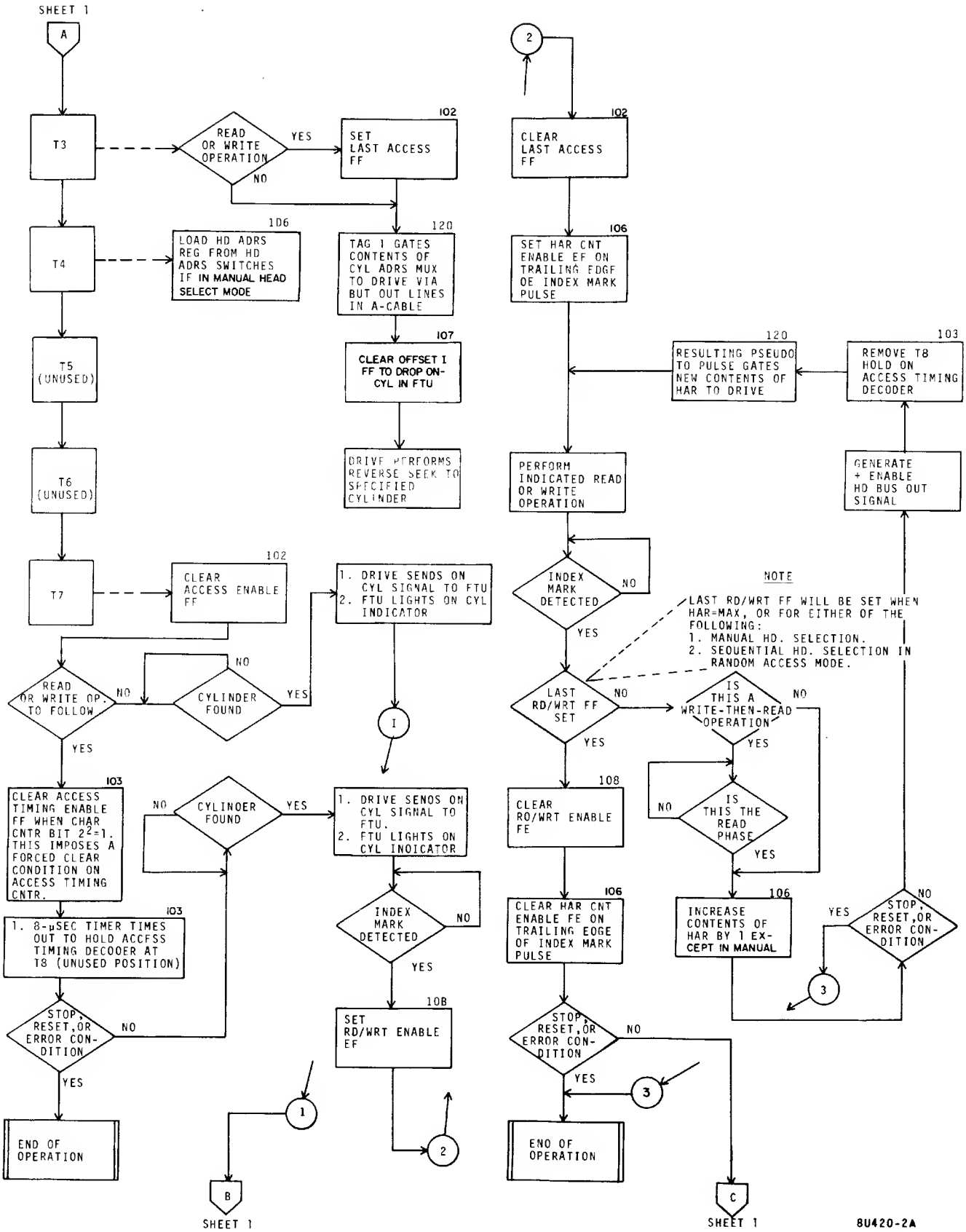


Figure 3-2. Sequential Reverse Seek Flowchart (Sheet 2 of 2)

SEQUENTIAL FORWARD (SEQ FWD) SEEK

Figure 3-3 shows the Sequential Forward Seek flowchart.

This operation is essentially the same as Sequential Reverse. The only difference is that the count in the Cylinder Address register (CAR) is increased by 1 at T1, rather than being decreased by 1 at T2. Because the first seek address is not critical, it is not necessary to clear CAR before starting the operation. In practice, however, an RTZ seek is usually performed prior to the SEQ FWD function, so CAR will be zero.

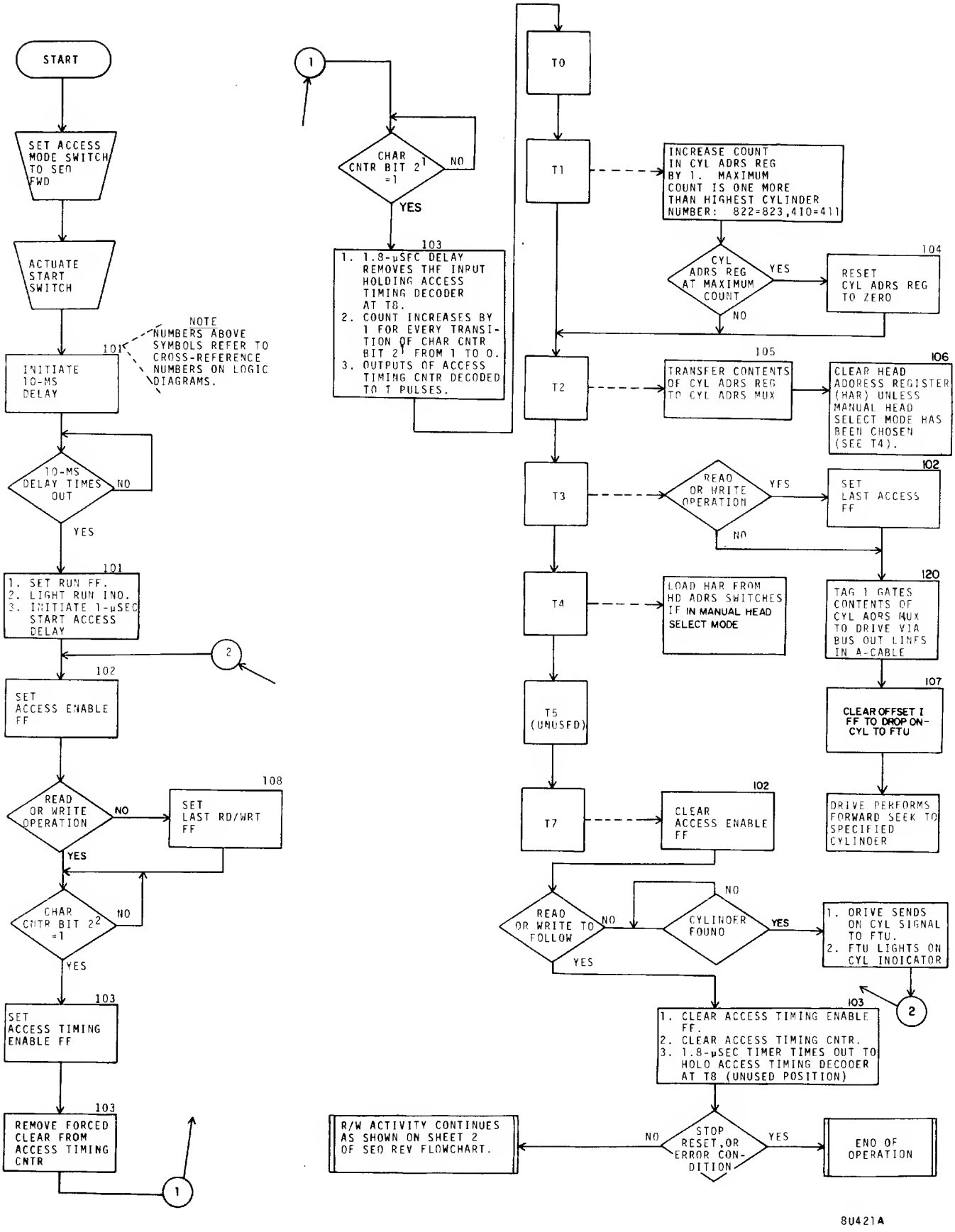


Figure 3-3. Sequential Seek Flowchart

CONTINUOUS (CONT) SEEK

Figure 3-4 shows the Continuous Seek Flowchart.

This operation performs repeated seeks that alternate between the address set in the Cylinder Address switches and the address present in CAR at the start of the operation. The contents of CAR do not change during the operation.

The "first seek" address depends solely upon the state of the Alternate FF at the beginning of the operation. If the FF is set, it will be cleared at T1 and the contents of the Cylinder Address switches will be transferred to the Cylinder Address Mux at T2, and thence to the drive at T3. On the other hand, if Alternate is initially in the cleared state, it will be set at T1, causing the contents of CAR to be gated to the drive at T3. Normally, an RTZ function precedes a CONT seek, and leaves the Alternate FF in the set state. The first Continuous seek, then, will be to the address set in the switches.

As with sequential FWD or REV access modes, a sequential head select mode results in reading (writing) an entire cylinder before doing the next seek. For manual head selection, the selected track is read (written) once, and a new seek initiated.

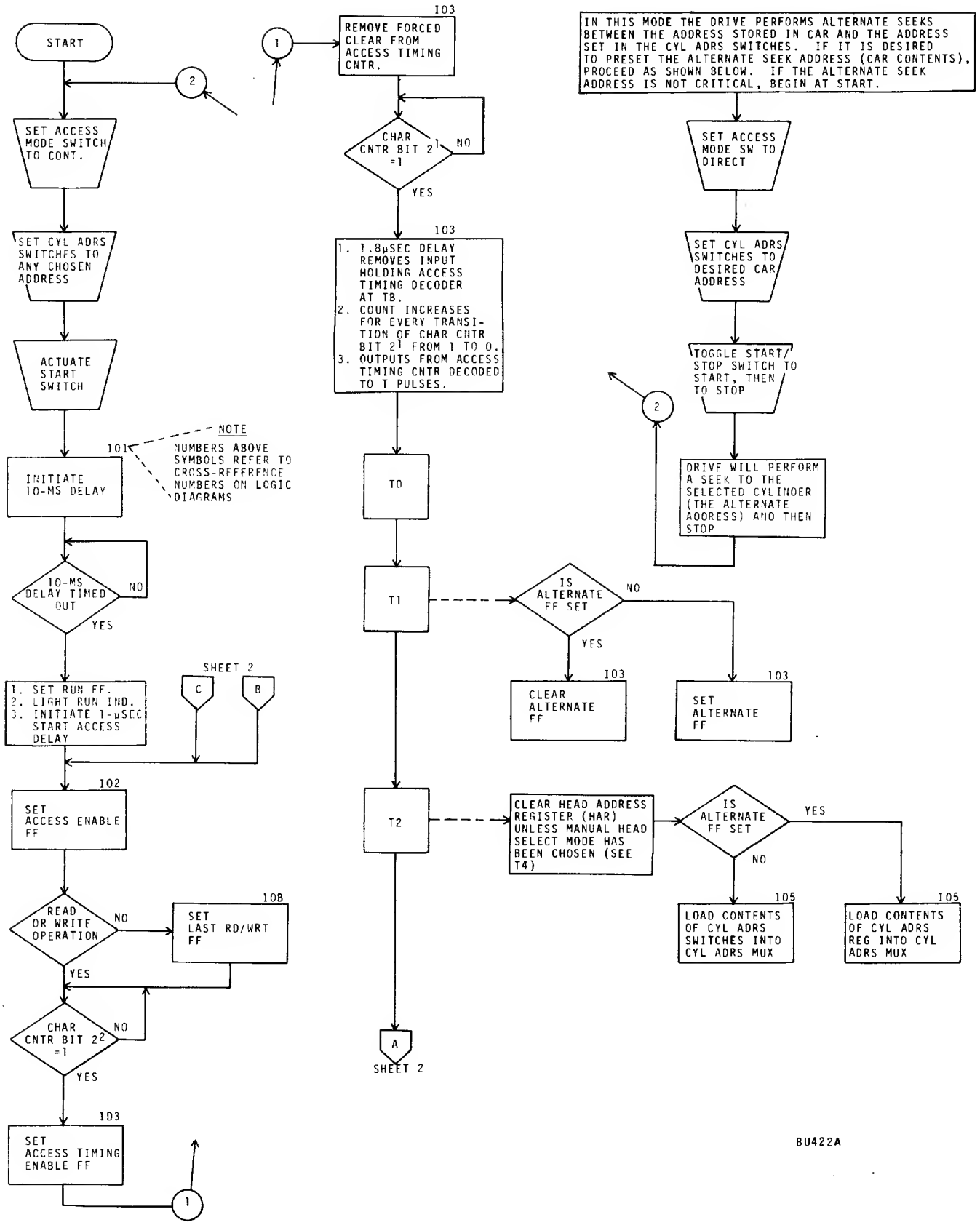


Figure 3-4. Continuous (Alternate) Seek Flowchart (Sheet 1 of 2)

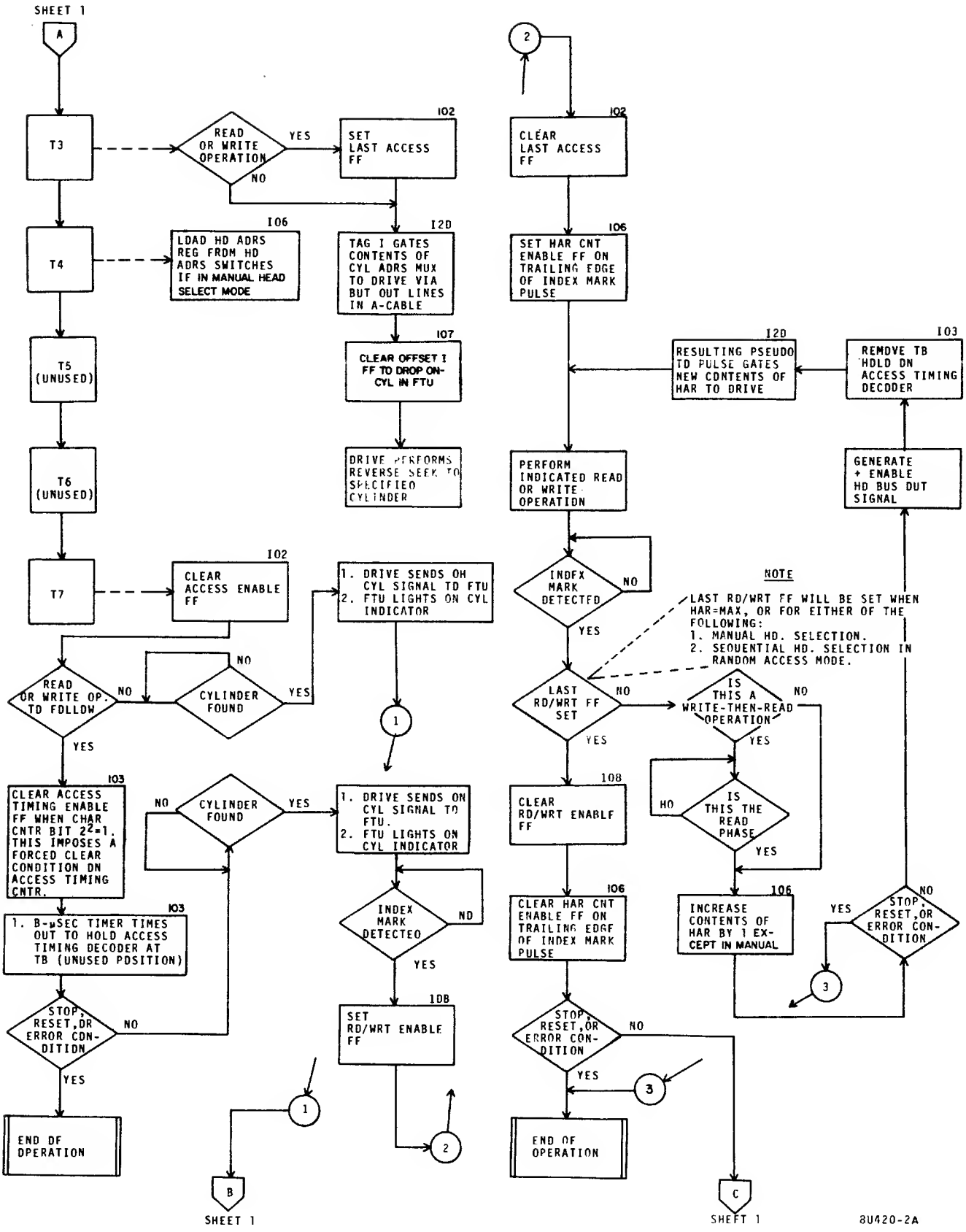


Figure 3-4. Continuous (Alternate) Seek Flowchart (Sheet 2 Of 2)

DIRECT SEEK

Figure 3-5 shows the Direct Seek flowchart.

When the access mode is Direct, the clock input to the Access Enable FF is disabled.

The FF is preset (preset input enabled) by actuating the START switch, and cleared (pre-clear or Reset input enabled) at T7. Consequently, only one seek is performed for each actuation of the START switch.

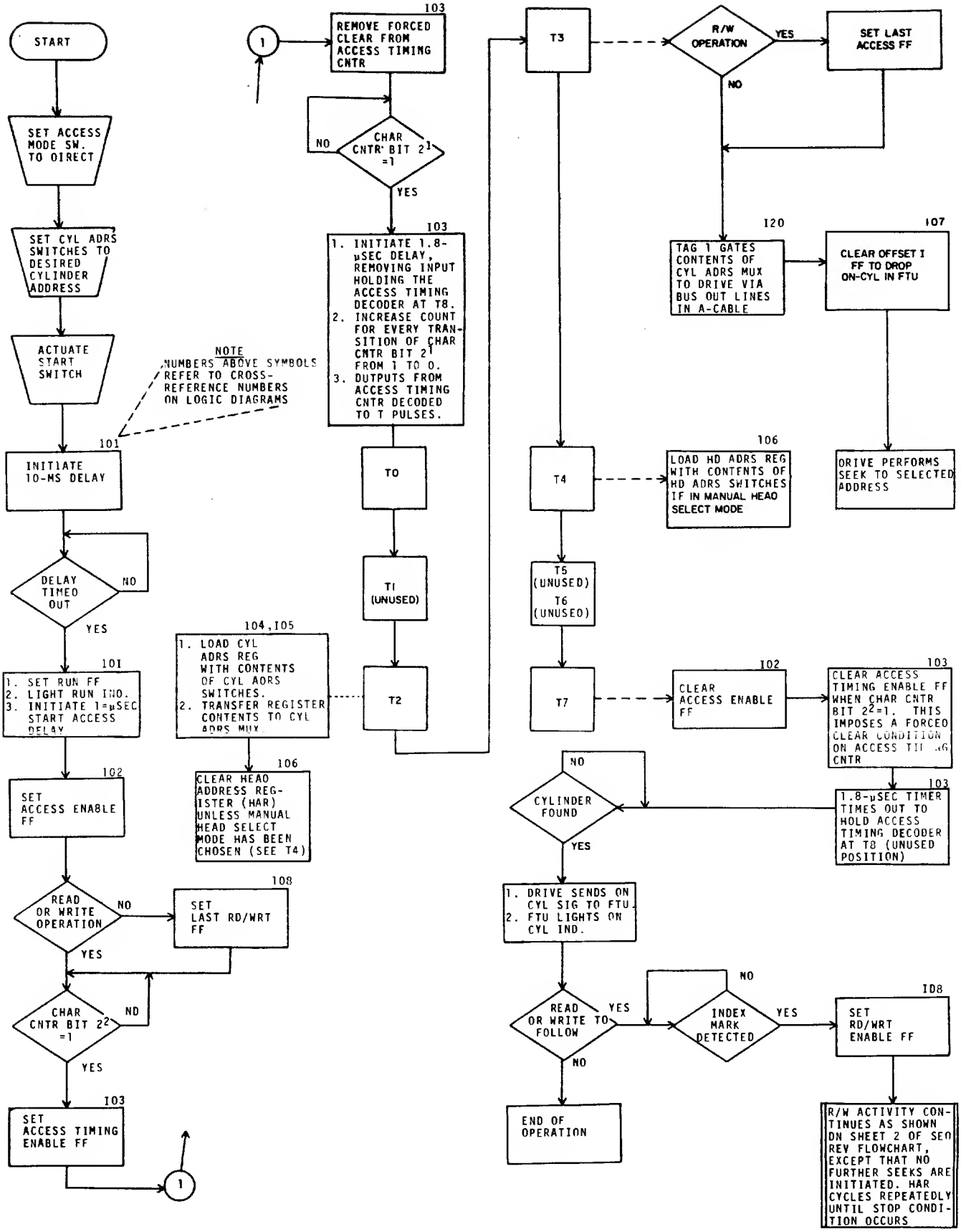


Figure 3-6. Direct Seek Flowchart

BU423A

RANDOM (RAND) SEEK

Figure 3-6 shows the Random Seek flowchart.

In this mode, the contents of CAR is increased by 1 for each servo clock pulses (FTU Write Clock) that occurs while the drive is "off cylinder". When the drive returns an On Cylinder signal, CAR stops counting and contains the address that will be sent to the drive when the next Seek command is issued.

The contents of CAR is loaded into the Cylinder Address Mux by the first 806-kHz pulse occurring during T2. At T3, this address is gated to the drive. Even if the drive is already on cylinder (as it would be, for example, if RTZ were selected just prior to the Random operation), it brings down On Cylinder for a minimum of 30 μsec. For the first Random seek, then, CAR counts up during this 30-μsec period. For succeeding seeks (in Random), the counting time is determined by how long it takes the drive to move to the new cylinder and respond with the On Cylinder signal.

This operation is unique in that it does not clear HAR during a Sequential head selection. Moreover, whether in Sequential or Manual (head select modes), only one R/W operation is executed for each seek. That is to say, for Write Then Read mode, a seek is initiated for every two disk revolutions; for other R/W modes, a seek is initiated after each revolution.

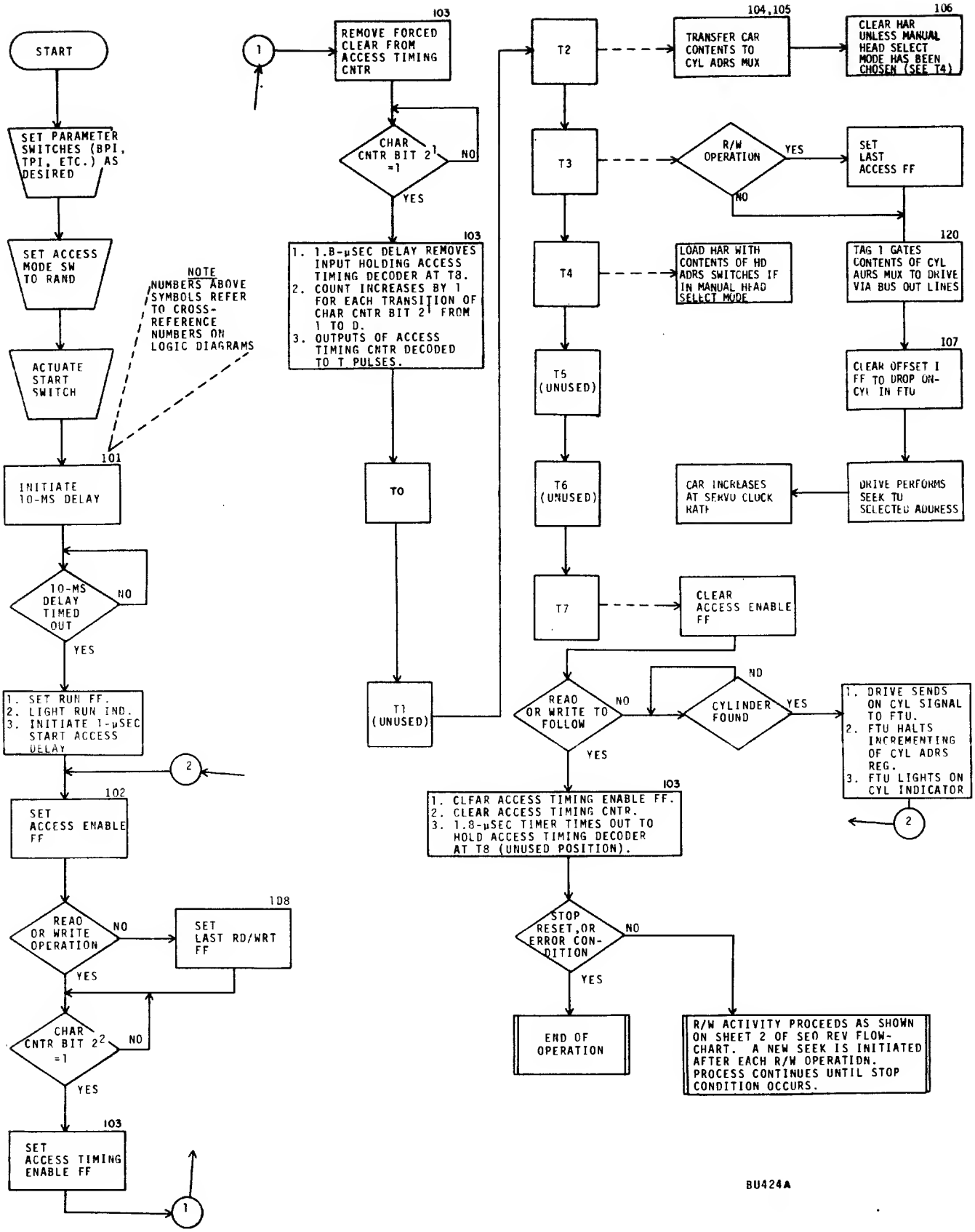


Figure 3-6. Random Seek Flowchart

READ/WRITE OPERATIONS

Read or Write operations are performed by raising the Read Gate or Write Gate signals to the drive, as shown in figure 3-7. Figures 3-8 through 3-13 show how each Wrt-Rd mode (except Write then Read, which is a combination of Write and Read operations on successive disk revolutions) affects and interprets the basic track format. Timings shown in figure 3-7 are valid for a 3600 rev/min drive, which as this is written are the only drives available for testing with the TB304. The other figures relate the track format to character counts, which are the same for either speed.

WRITE FORMAT SEQUENCE

The Write Format sequence writes an entire track from the Address Mark to the end of the data field, arbitrarily timed to coincide with character 13,376. Figure 3-8 shows the now-familiar track format, with the character counts that start and stop the various fields. Use this figure as a reference when following the Write Format flowchart (figure 3-9).

NOTE

One character is equal to 12 bits of data. One byte = 8 bits. Therefore, 2 characters = 3 bytes.

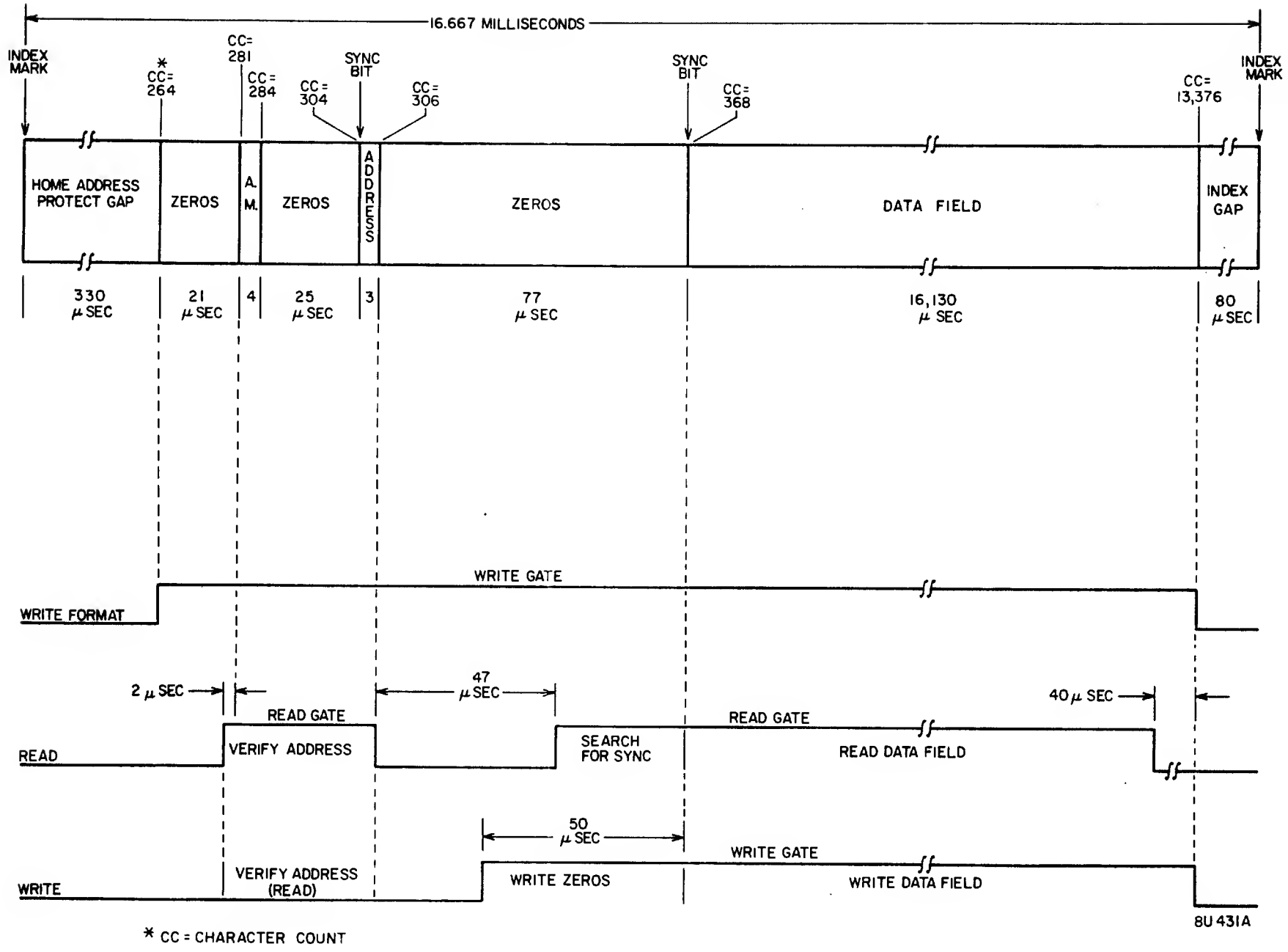


Figure 3-7. Track Format and Basic R/W Timing

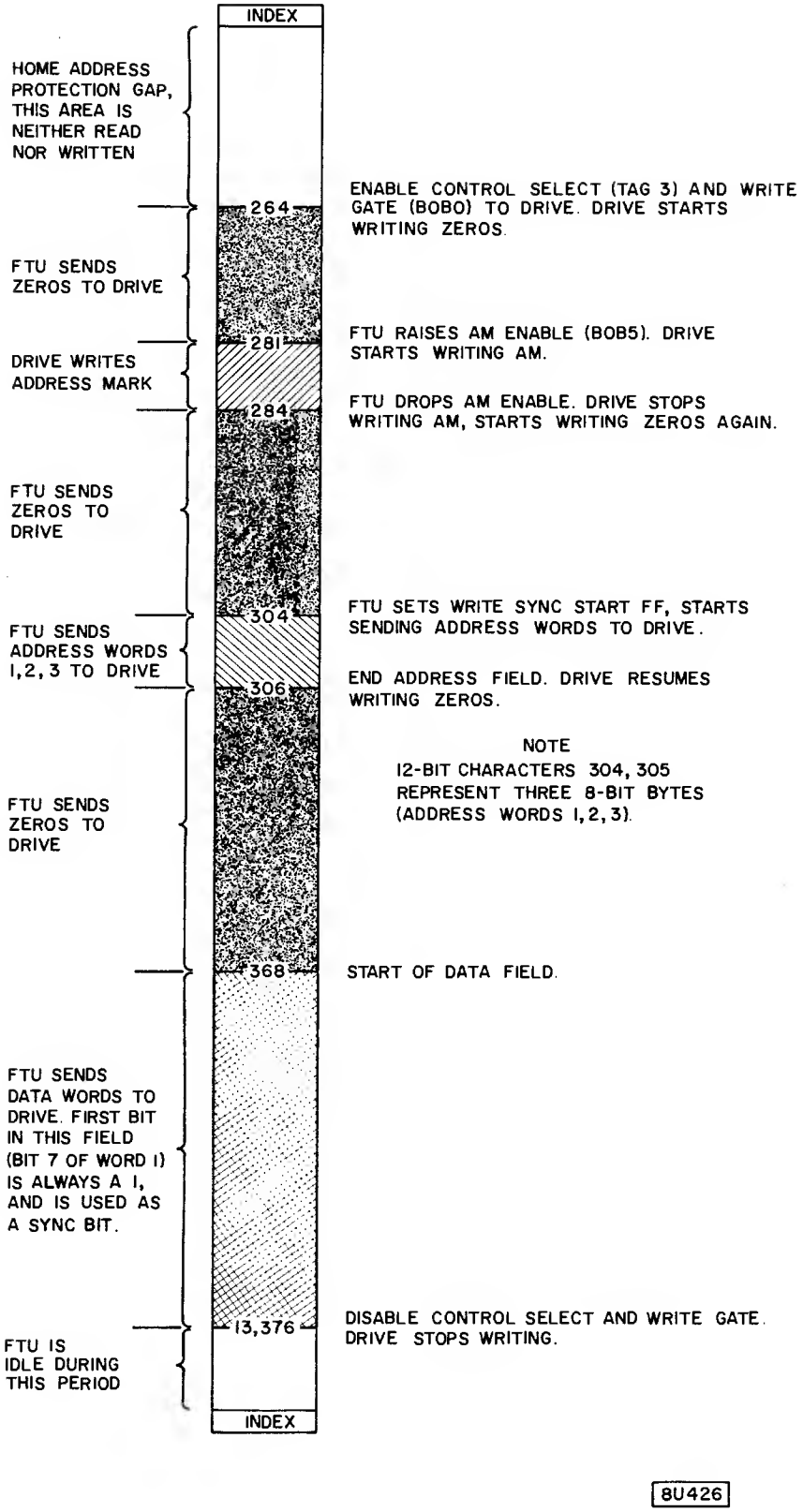


Figure 3-8. Write Format Track Pattern

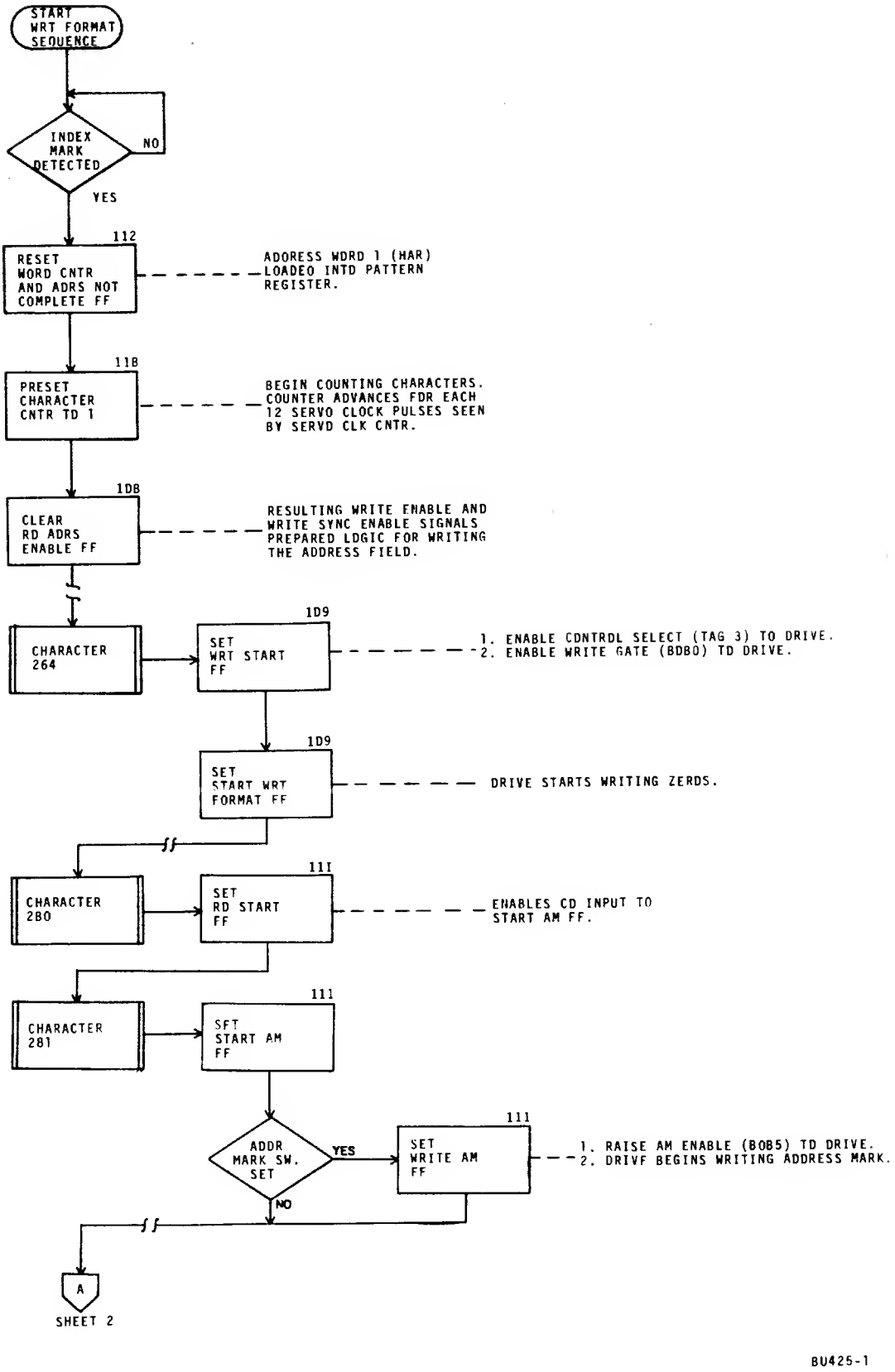
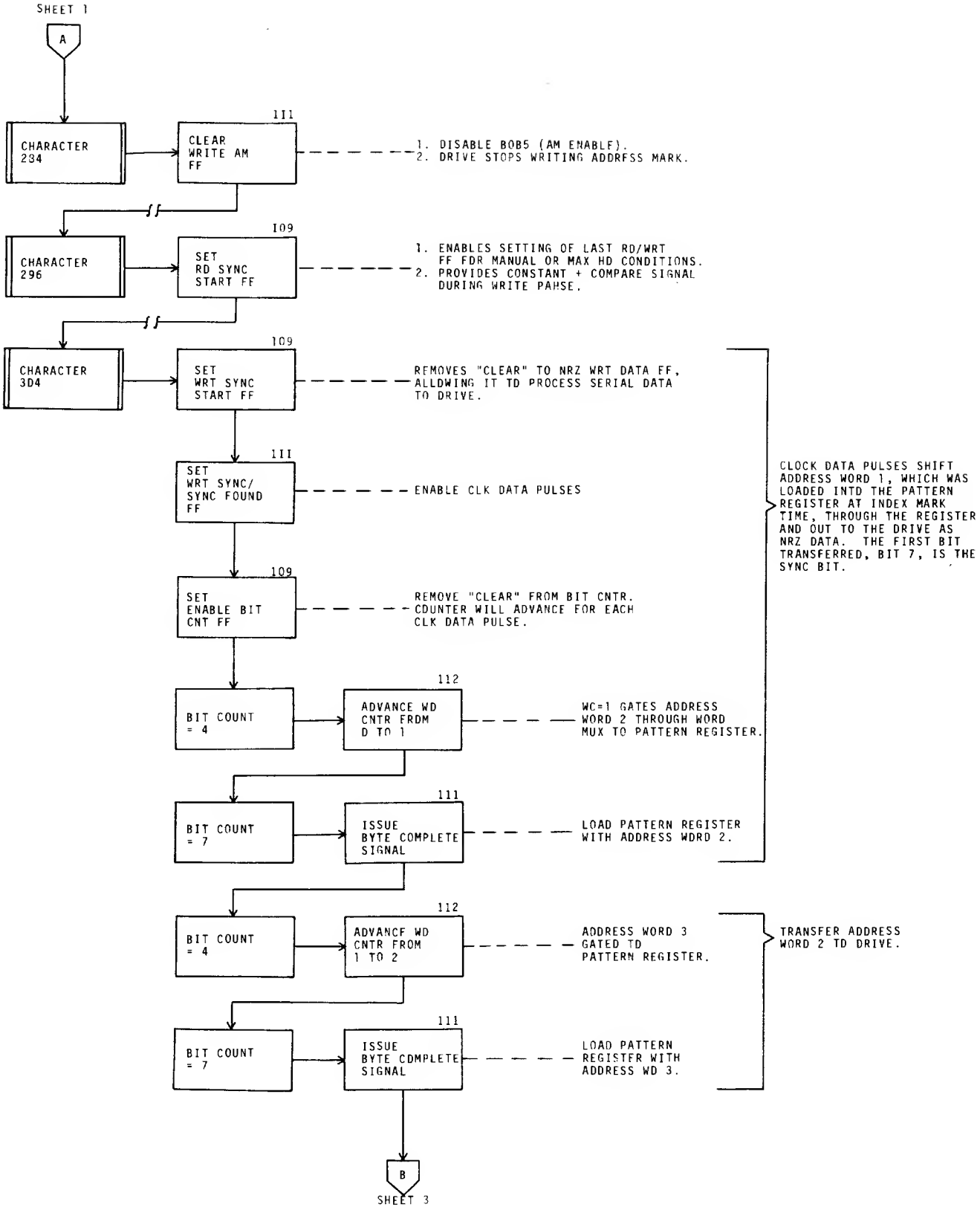


Figure 3-9. Write Format Flowchart (Sheet 1 of 5)



8U425-2

Figure 3-9. Write Format Flowchart (Sheet 2 of 5)

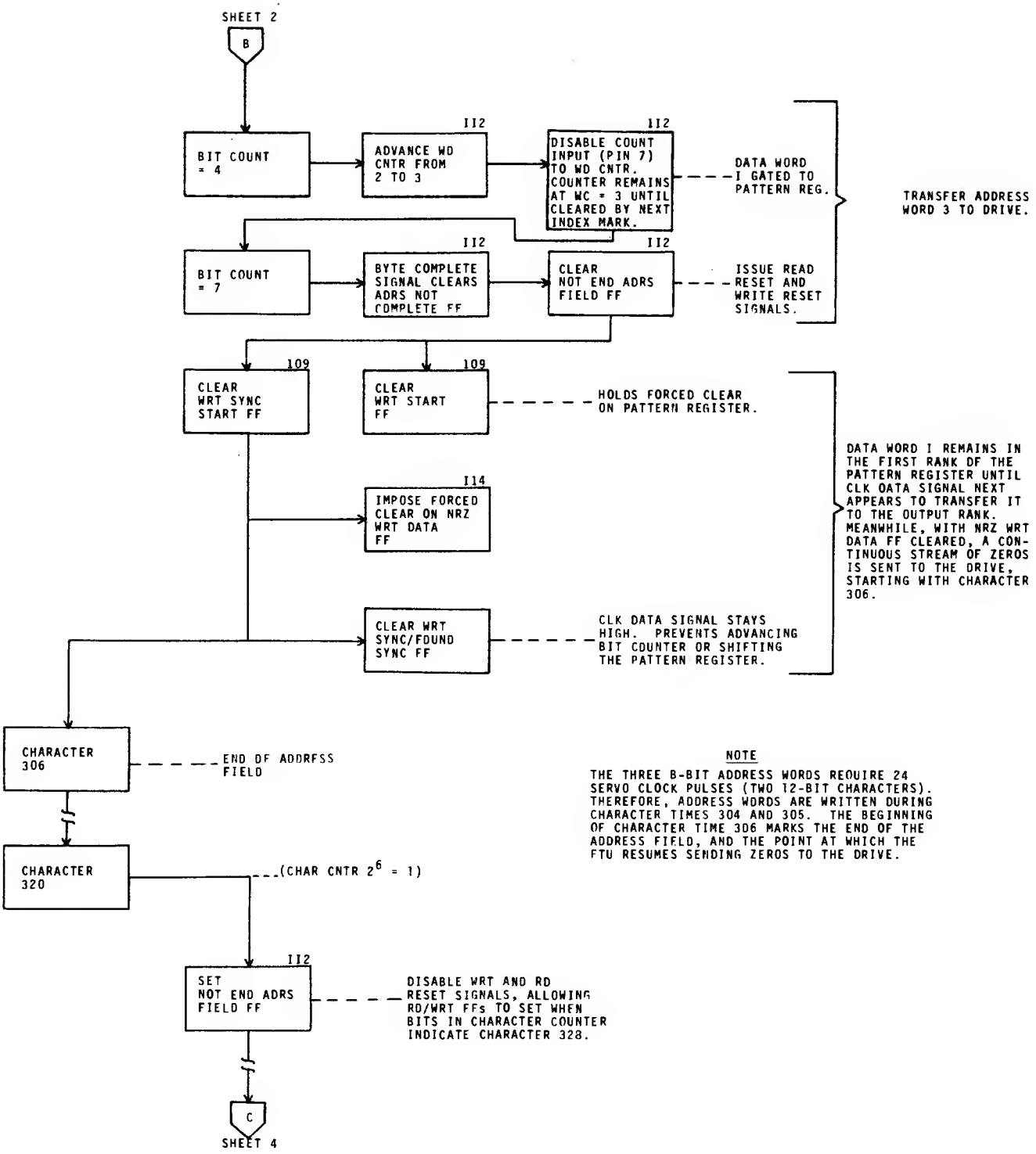


Figure 3-9. Write Format Flowchart (Sheet 3 of 5)

8U425-3

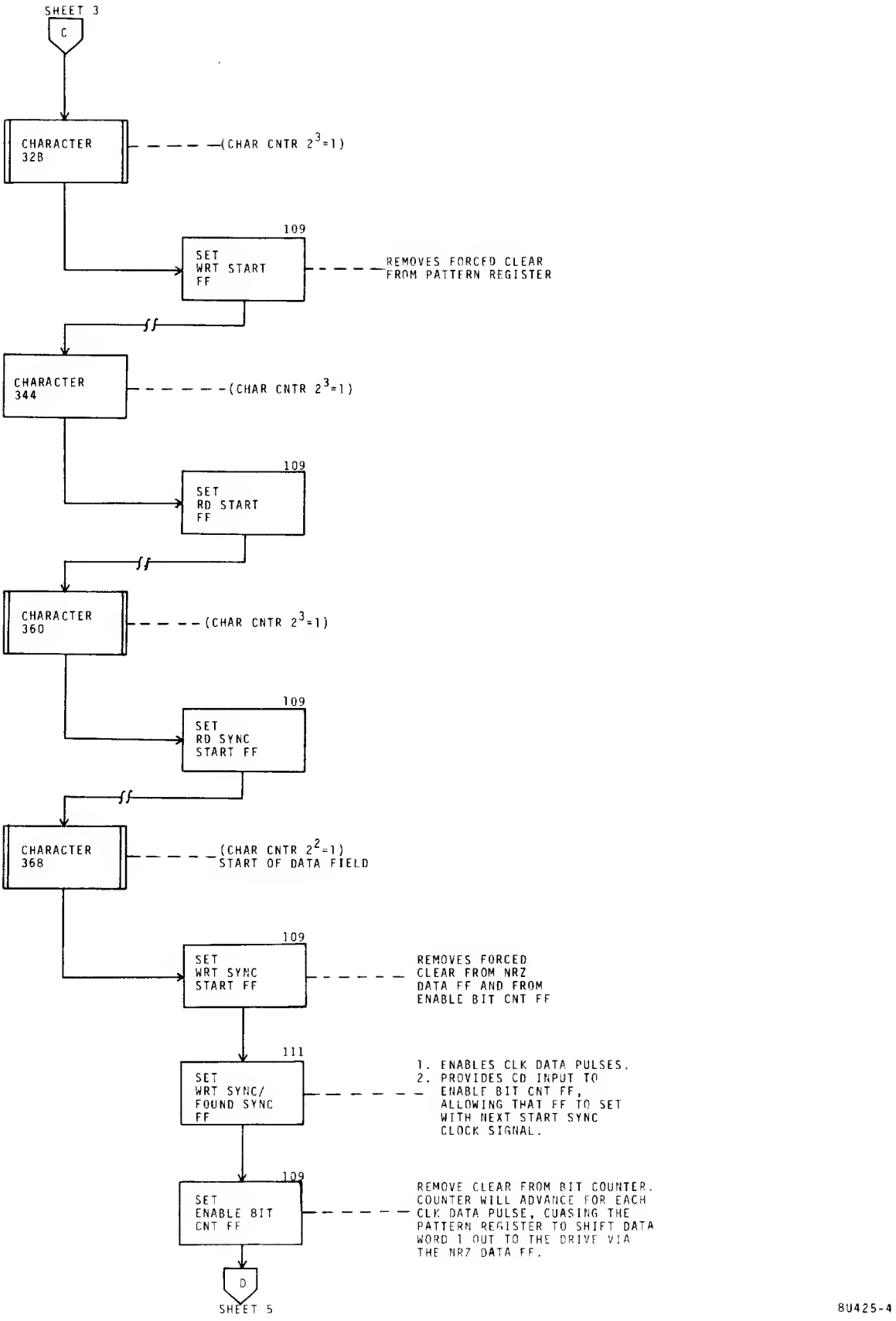


Figure 3-9. Write Format Flowchart (Sheet 4 of 5)

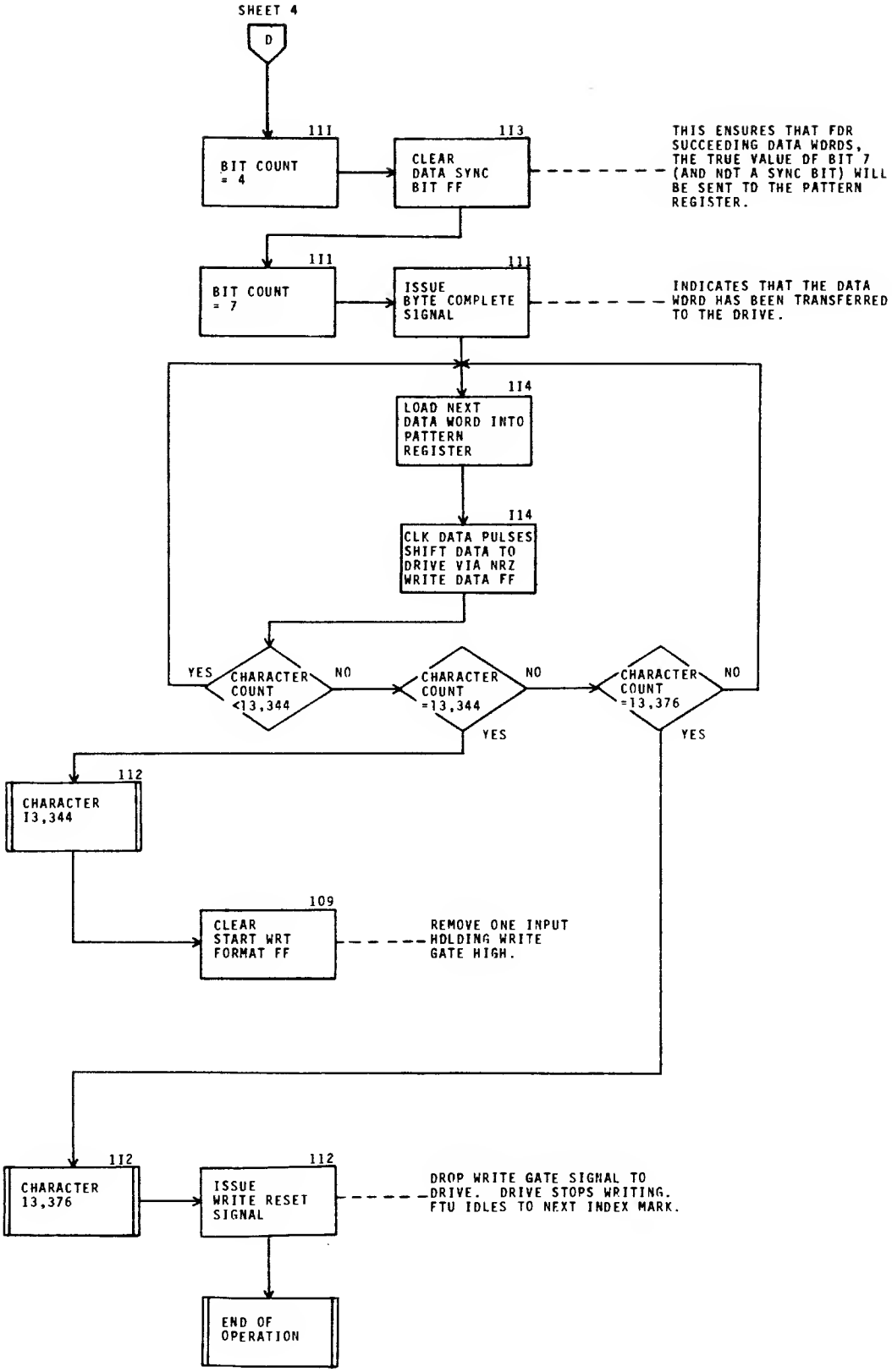


Figure 3-9. Write Format Flowchart (Sheet 5 of 5)

8U425-S

READ SEQUENCE

The Read sequence brings up the Read Gate twice. Once to read the address field and again to read the data field. Although the zero field following Address Mark is "read" by the FTU, the bits cannot be shifted in the Pattern register because the Clk Data pulses do not start until the Address Sync bit is found (at Character time 304). Figure 3-10 shows where the FTU "idles" through the first portion of the zero field that follows the address field.

When checking for the data sync bit, Read Gate is raised early enough to allow for any minor variation in disk speed -- that is, 16 counts before the sync bit is supposed to appear (roughly 20 µsec). By the same token, Read Gate is dropped 32 counts before the end of the data field.

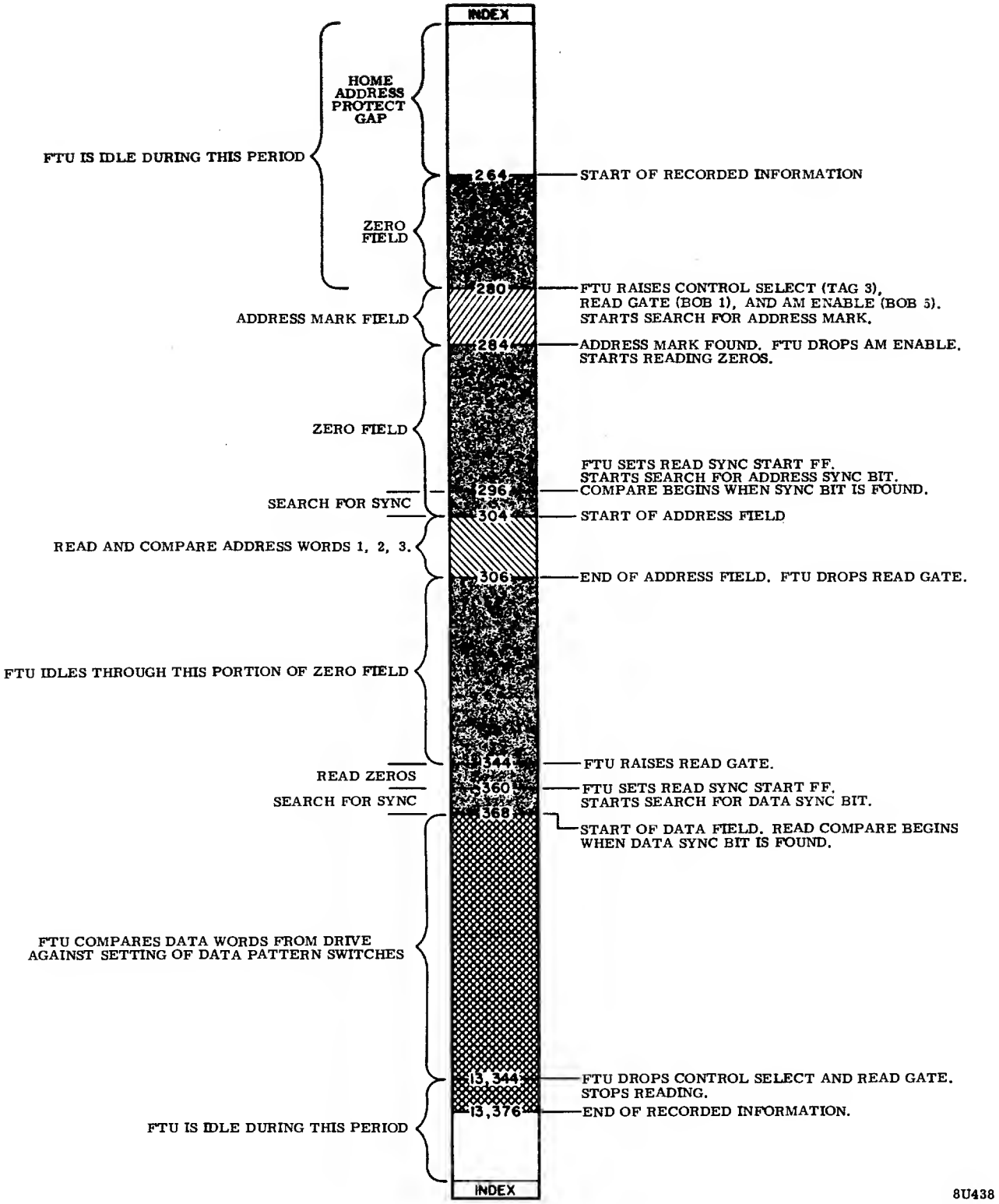


Figure 3-10. Read Track Pattern

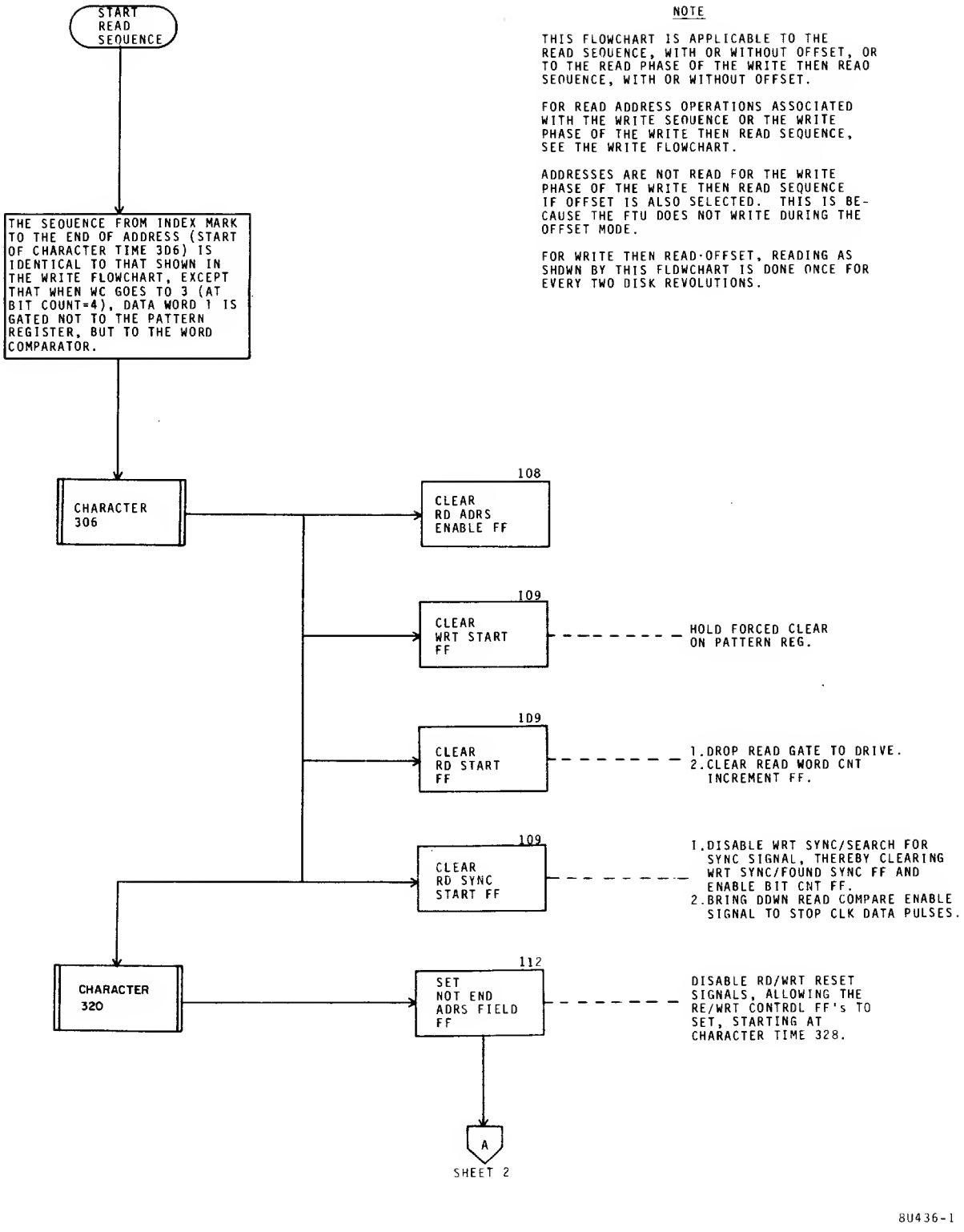


Figure 3-11. Read Flowchart (Sheet 1 of 3)

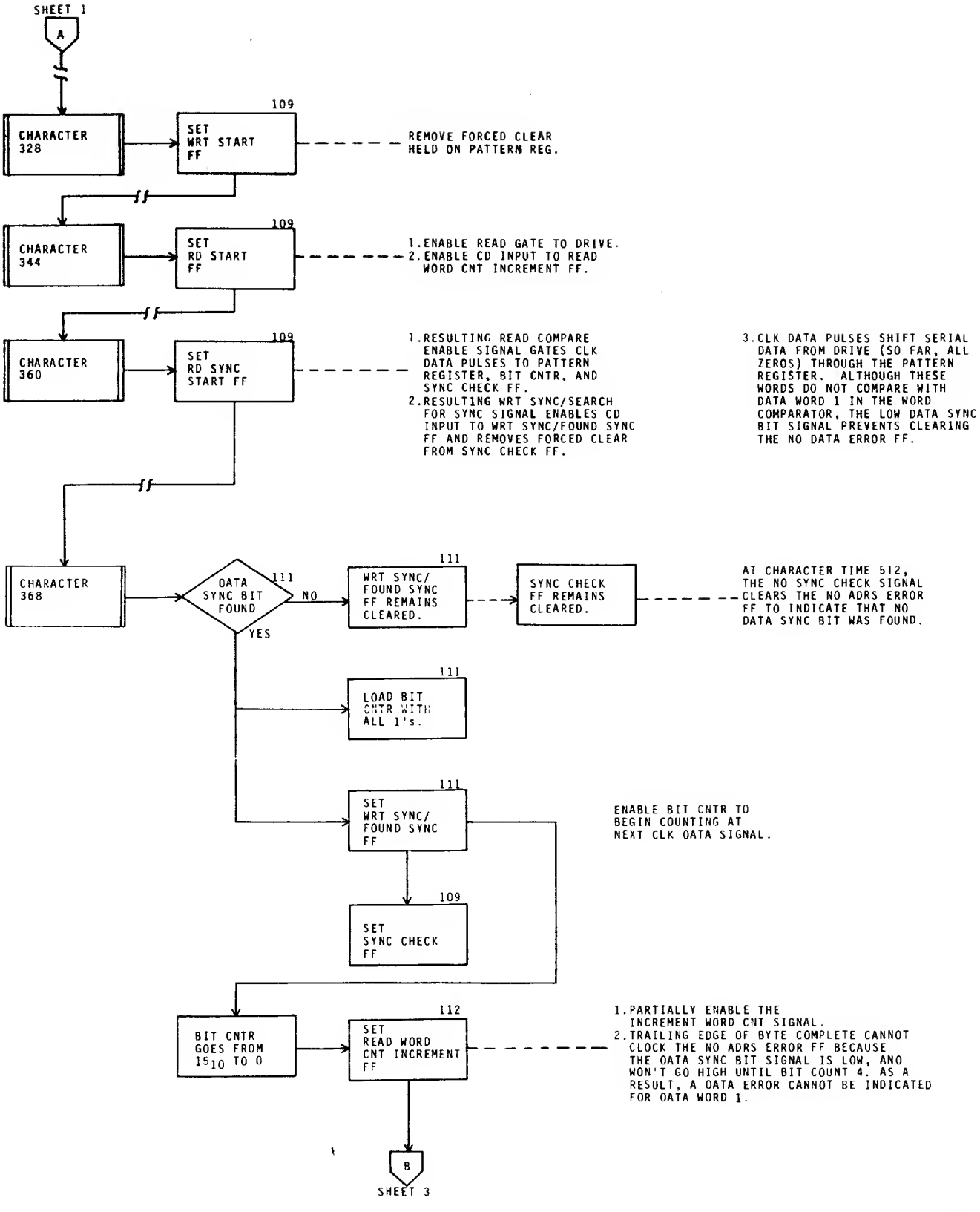
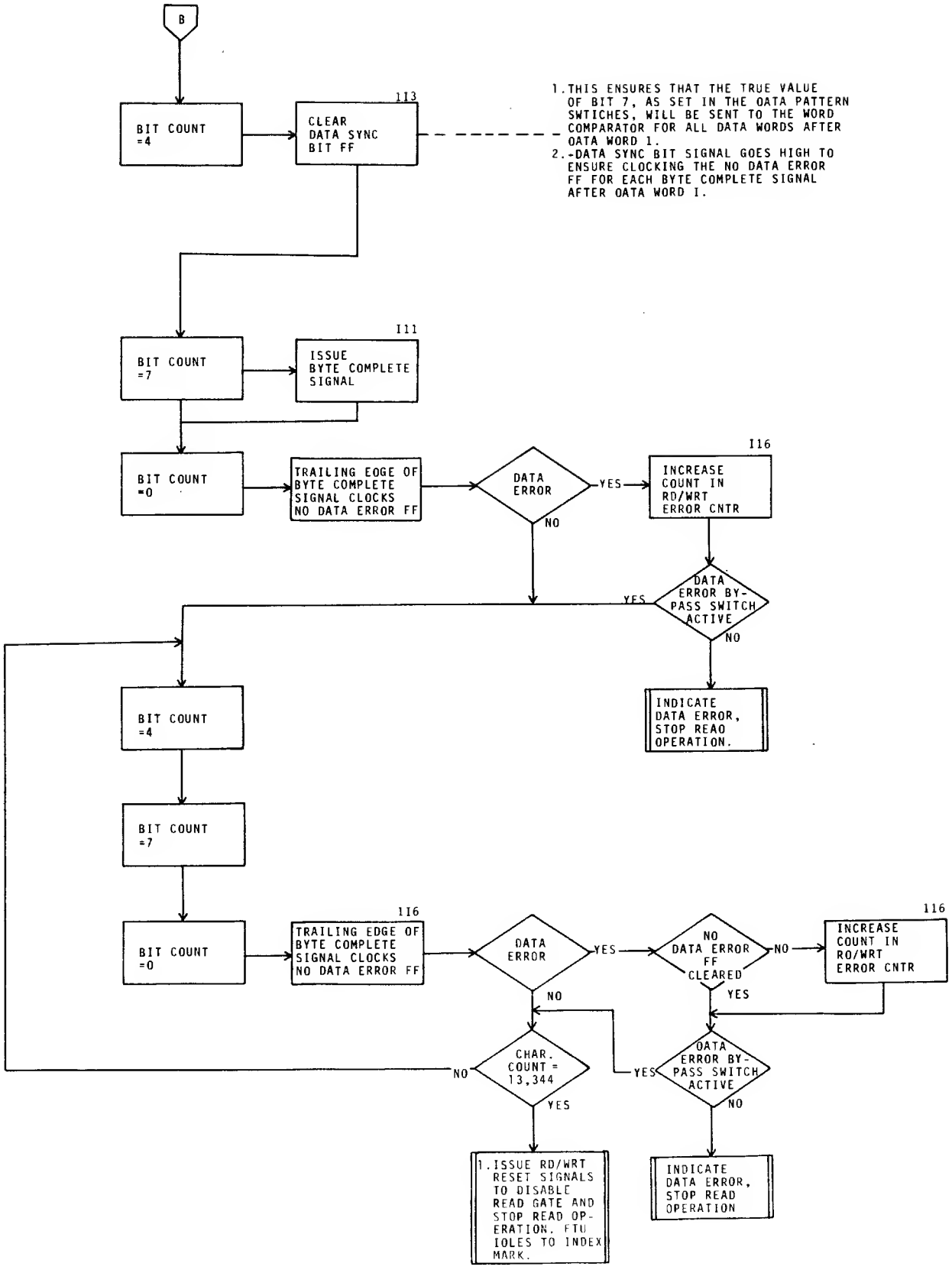


Figure 3-11. Read Flowchart (Sheet 2 of 3)



BU436-3

Figure 3-11. Read Flowchart (Sheet 3 of 3)

WRITE SEQUENCE

The Write sequence is identical to the Read sequence up to character time 328, at which point the FTU raises Write Gate and the drive starts writing zeros. The data field is written as for Write Format. The Write track pattern and the Write Sequence flowchart are shown in figures 3-12 and 3-13, respectively.

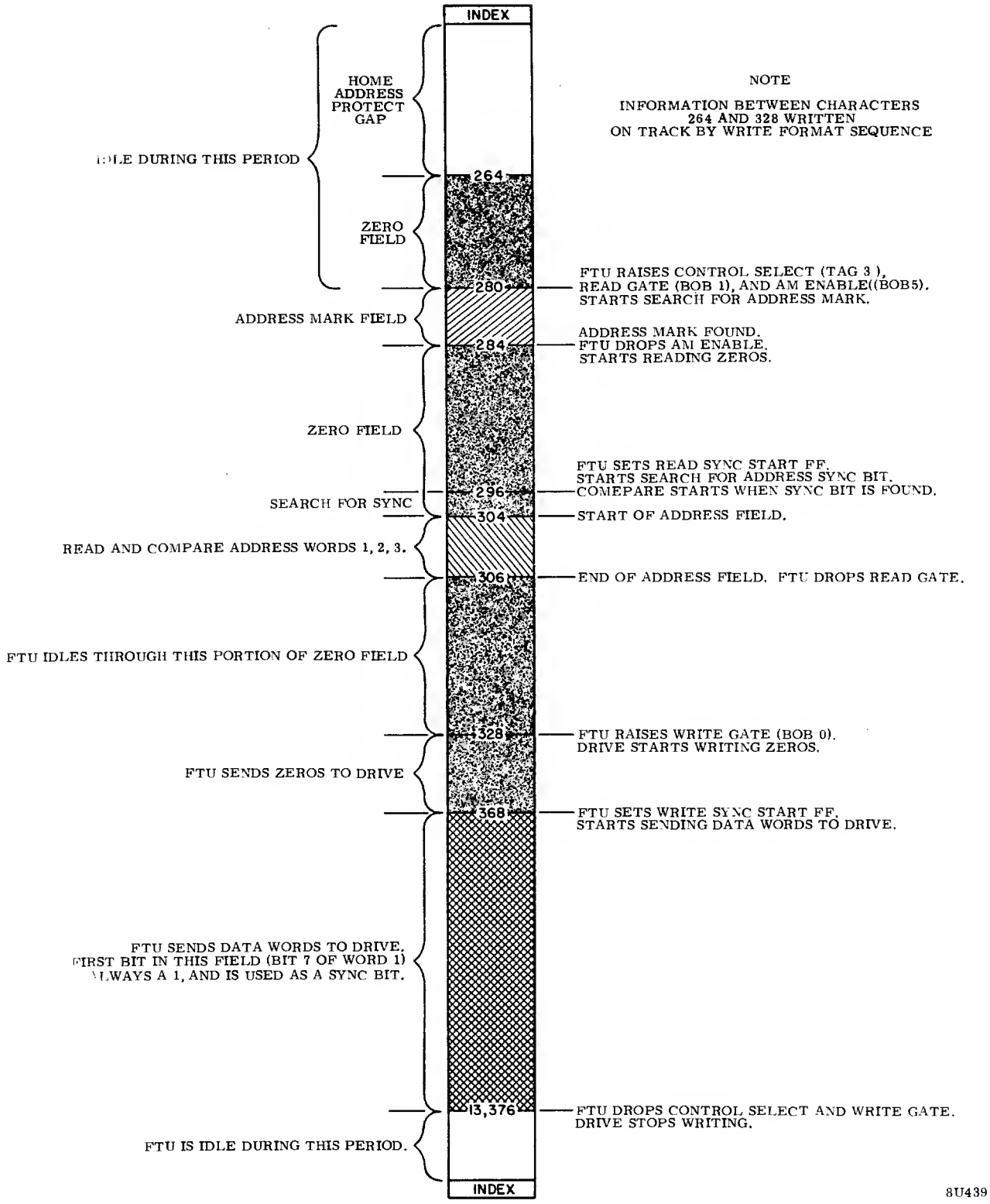


Figure 3-12. Write Track Pattern

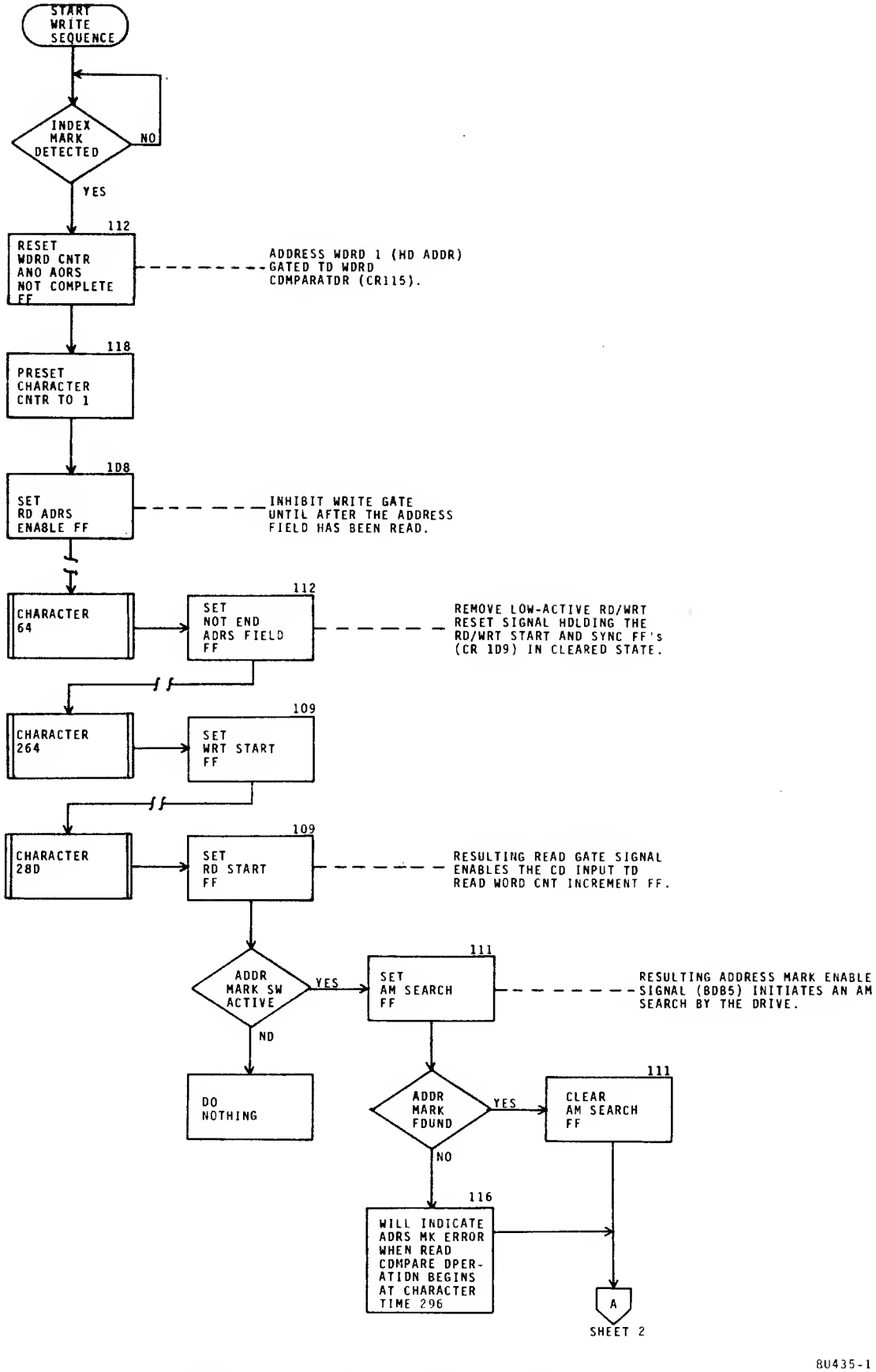


Figure 3-13. Write Flowchart (Sheet 1 of 5)

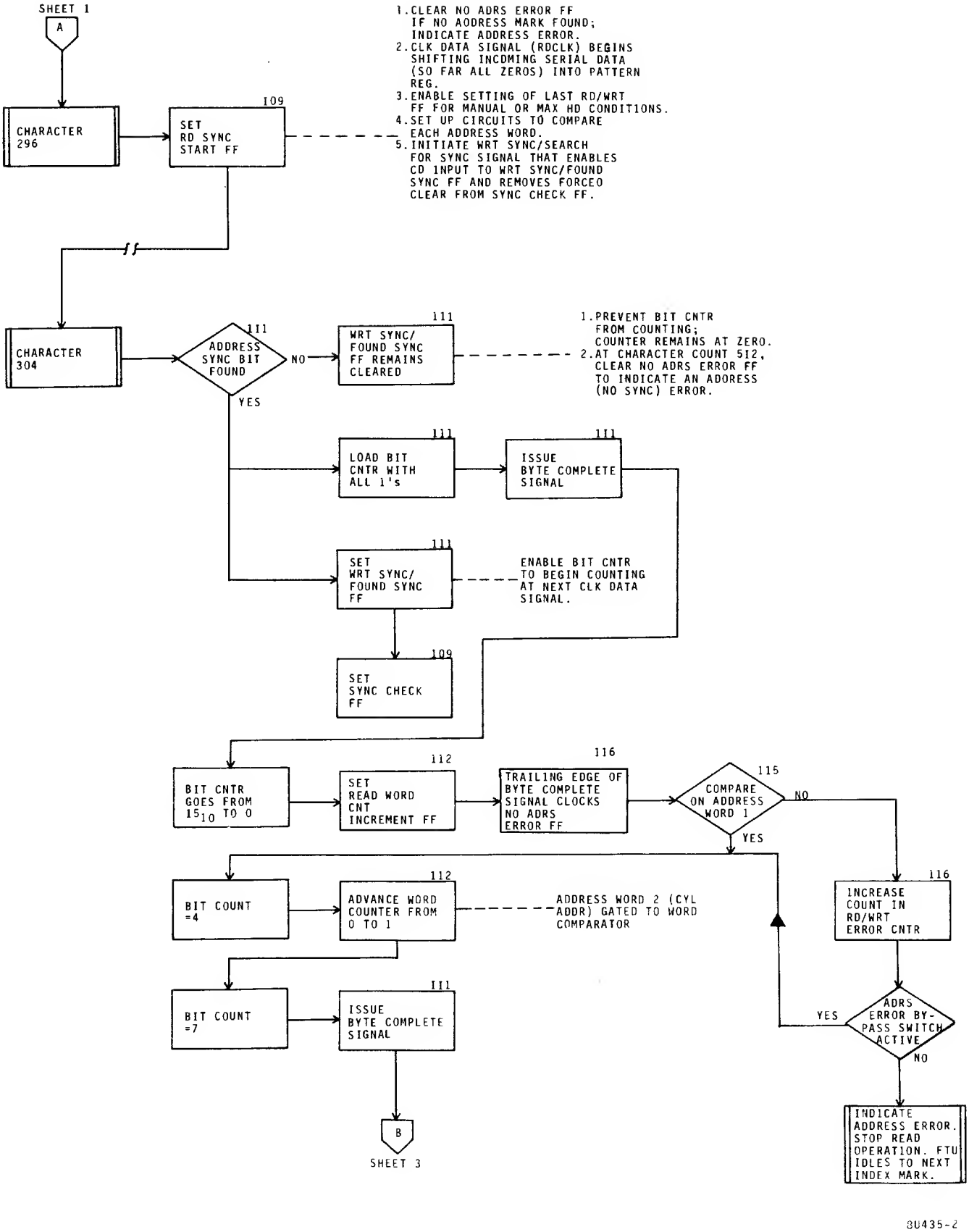


Figure 3-13. Write Flowchart (Sheet 2 of 5)

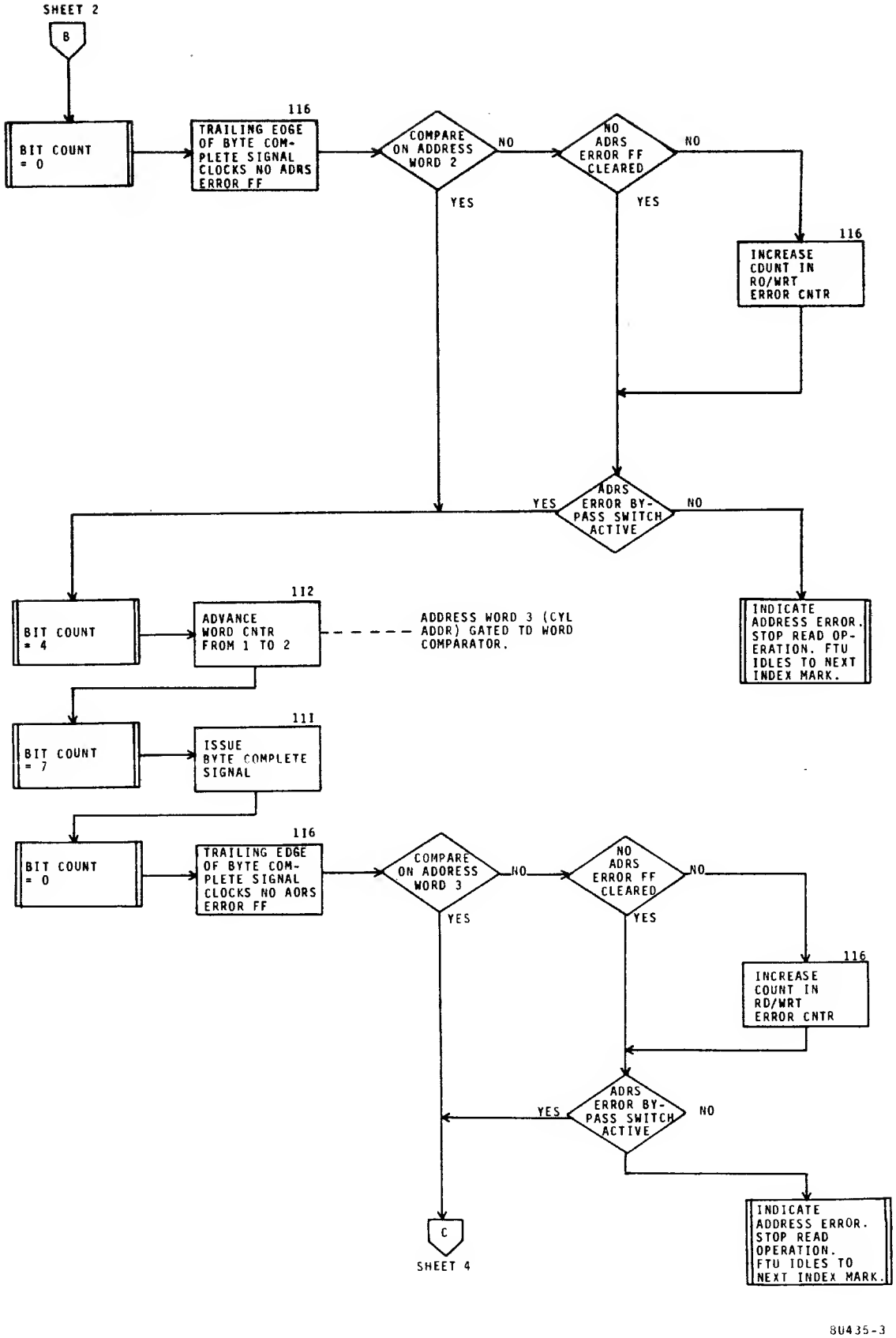


Figure 3-13. Write Flowchart (Sheet 3 of 5)

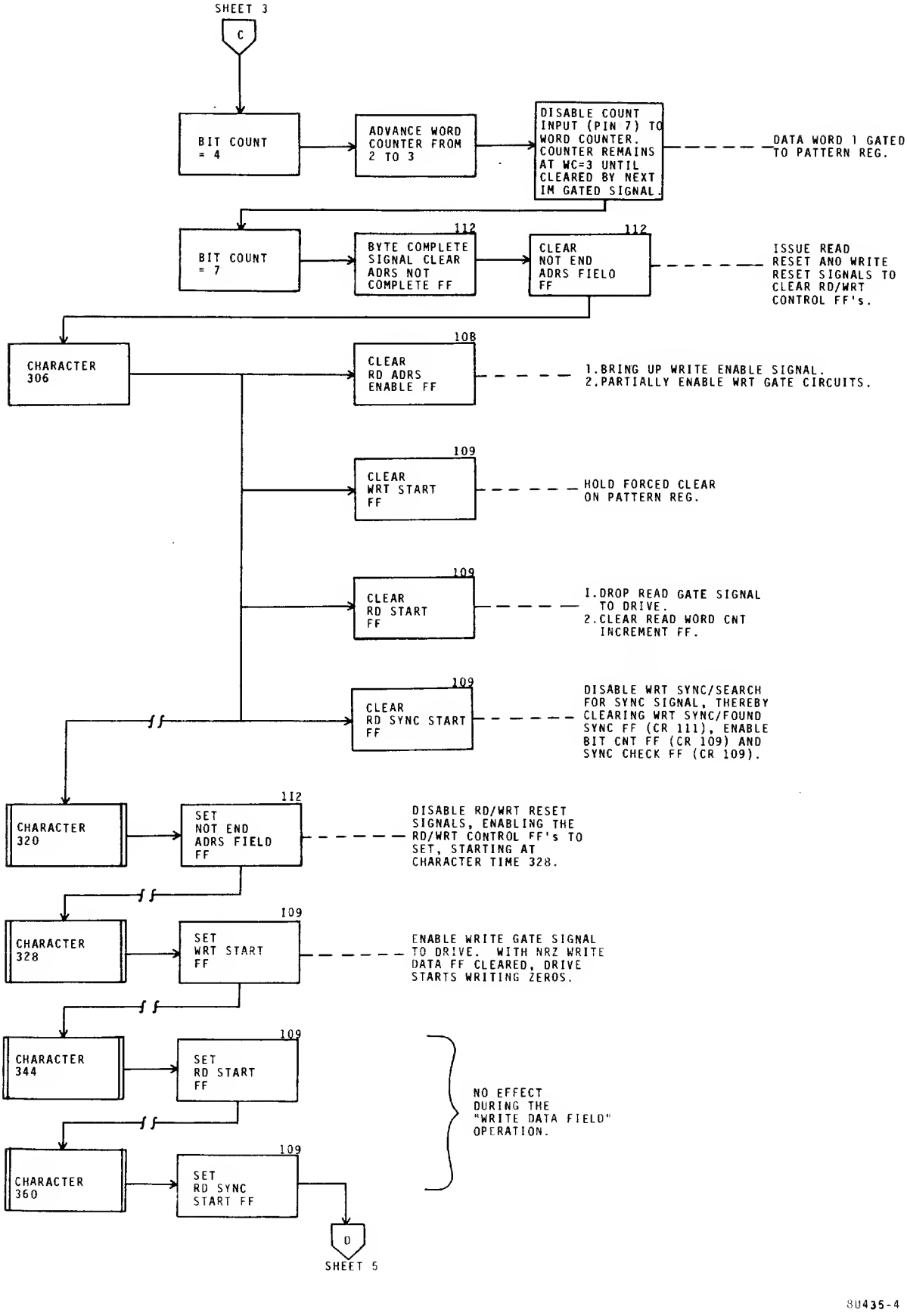


Figure 3-13. Write Flowchart (Sheet 4 of 5)

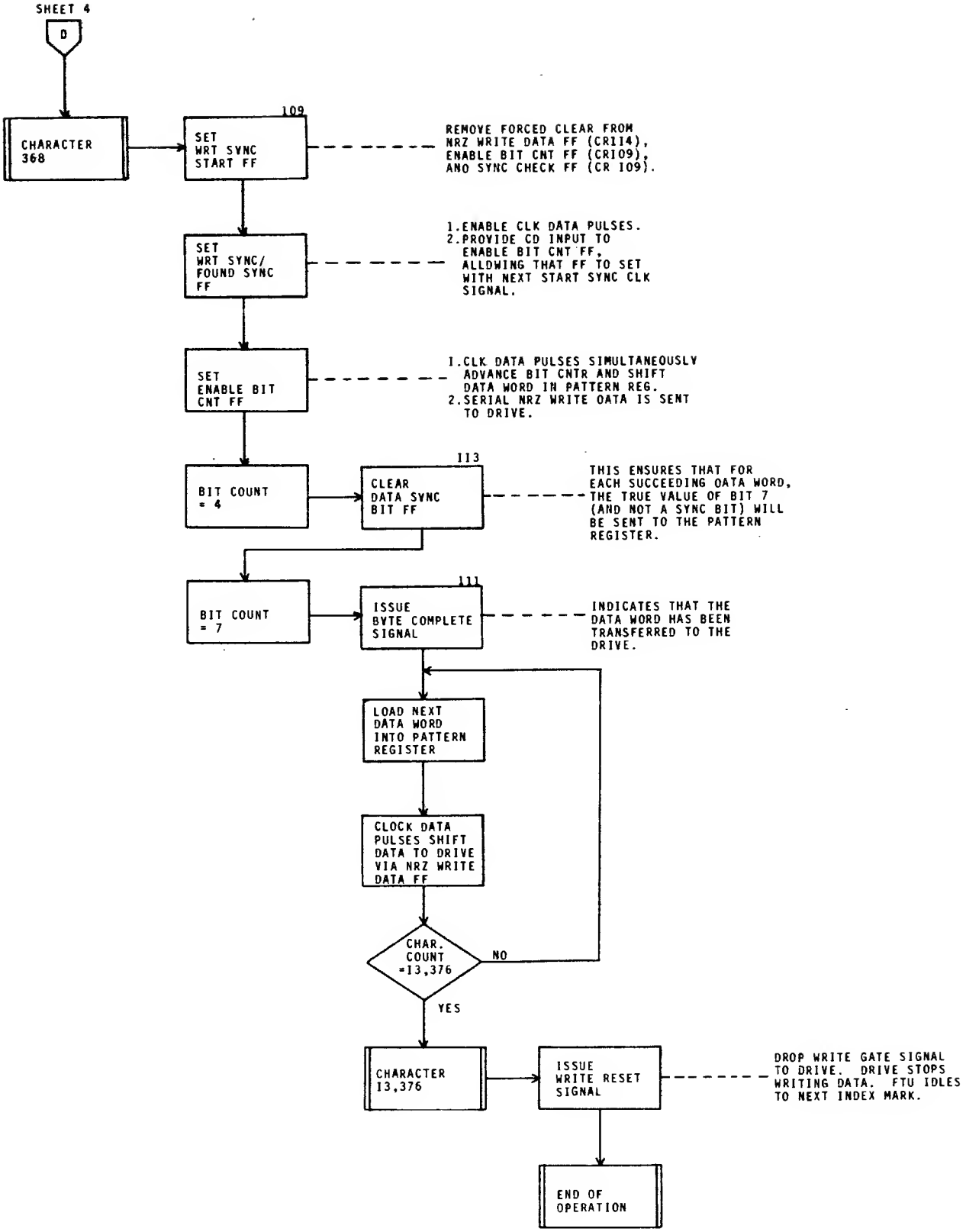


Figure 3-13. Write Flowchart (Sheet 5 of 5)

OFFSET MODE/DELAYED ON CYL

Figure 3-14 describes how the On Cylinder Detected signal is delayed by 4 ms during an Offset operation. The delay is necessary because the On Cylinder signal from the drive, once the drive has found the cylinder address, drops while the heads are moved to the offset position. When the offset move has been completed, On Cylinder comes up again to retrigger the 4-ms delay. When the delay times out, the On Cyl Delayed FF is set, propagating the On Cyl Detected signal to the FTU logic.

The delay is also operative when the MAINTENANCE switch on the FTU Panel is active.

Writing cannot be performed during the Offset mode.

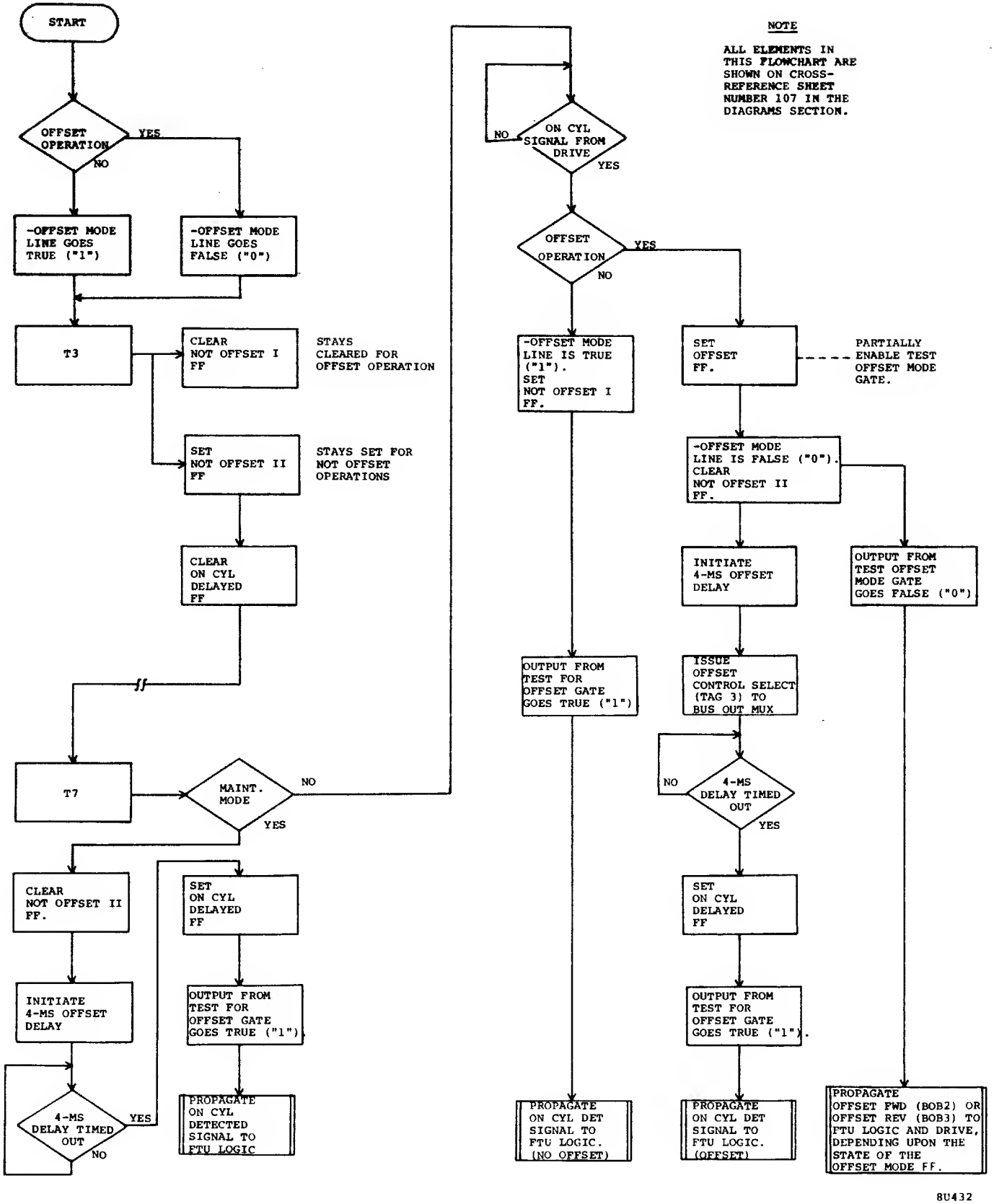


Figure 3-14. Offset/Delayed On Cyl Flowchart

FTU ERROR LOGIC

Of the five error indications provided on the FTU control panel, SEEK ERROR (as well as FAULT indicator) is generated in the drive. The following pages describe the four error indications that are detected by the FTU logic.

ADDRESS ERROR/DATA ERROR LOGIC (CR 116)

If the FTU is in Maintenance mode, or if the I/O Bypass cable is connected, the address/data error logic is disabled. The FTU will not stop for these errors, nor will the error(s) be counted in the R/W Error Counter. In the Normal mode, the error logic is disabled by holding both the Address Error and Data Error FFs in a preset state.

A preset pulse to these FFs also occurs at Index Mark time if the corresponding Error Bypass switch is active. Under this Error Bypass condition, the FTU will not stop after an Address or Data error, but the error will be counted by the R/W Error counter. The presence of each error type is manifested by clearing the appropriate Error FF. Because the R/W Error counter is edge-triggered, contiguous errors (errors with no "valid" word between them) from either of the Error FFs will be counted as one error.

Address Errors

Address errors are of three kinds:

a. Address Mark error
b. Sync Check error
c. Address Word error

Address Mark Error (CR 111)

When the Address Mark switch is active, the AM Search FF is set by Read Gate at character time 280. The FF is cleared when the address mark is found. If the FF is still set (no address mark found) when Read Compare Enable comes up at character time 296, the Address Mark Error signal clears the Address Error FF (CR116).

Sync Bit Error (CR 116)

The address field sync bit occurs at about character time 304. The Data field bit occurs at about character time 368. If either of these sync bits are missing (-Sync Check = "1"), the Address Error FF will be cleared.

Address Word Error (CR 116)

If one of the three address words does not compare, the + Compare line will go low, as will the CD input to the Address Error FF. Because the FF is clocked by the trailing edge of Byte Complete for address words 1, 2 and 3 (-Word Count 3), the FF will clear.

It may be of interest to note that the + Compare line is held high until character time 304 (address), and again between the end of the Address field and character time 296, at which point the Bit Counter starts counting Data bytes. Thus, + Compare ensures that the FF will be initially set at the start of both the Address and Data fields, so as to be ready for the sync bit that begins each of those fields (as well as for any errors that might occur in the address field itself).

Data Errors

Data errors consist of Read Clock errors and Data Word errors.

Read Clock Error (CR 116)

Normally, Read Clock pulses will continually retrigger the Missing Read Clock one-shot. If, when Read Compare Enable comes up for the Address or Data fields, a clock pulse is missing, the one-shot will time out, thereby setting the Read Clock Error FF. This, in turn, clears the Data Error FF.

Data Word Error (CR 116)

The Data Error FF is set prior to the start of the Data field by the high held on the + Compare line. (The logic for Compare is shown on CR117.) The -Data Sync Bit line is high after the Address field, so the Data Error FF is clocked by Byte Complete, starting at character time 296. When the hold on + Compare goes away at character time 368, the compare sequence begins. A Compare error is registered by clearing the Data Error FF at the trailing edge of Byte Complete. The next valid compare will again set the FF. As described above, contiguous bytes in error are counted as one error.

SERVO CLOCK ERROR LOGIC (CR 116)

A Ready signal accompanying the Start Access pulse sets the Enable Servo Clock Error FF CR117). If a period of 200 nsec occurs without an FTU Write Clock pulse, the Servo Clock Error FF is set. The condition can be cleared only by actuating RESET. The FTU Write Clock may be either servo clock pulses from the disk, or pulses from the crystal oscillator in the FTU itself, depending upon the position of the MAINT/NRM switch on the FTU.

SECTOR MARK ERROR LOGIC (CR 117)

The Sector Mark (SM) Error FF is held in a precleared state by one of the following:

1. Enable Sector Mark Error signal = 0 (see CR 116 for conditions).

2. The normally cleared state of the Enable Servo Clock Error FF.

If case 1 exists, SM errors are not detected. The case to consider, then, is that in which the preclear on the SM Error FF is released by the presence of a Ready signal at Start Access time.

Normal Sequence

Index Mark (IM) sets the Load Sector FF, imposing a Load condition on the Sector counter by bringing pin 9 of that IC low. The Sector Counter is actually loaded by the trailing edge of the IM. The leading edge of the first SM after Index clears Load Sector, allowing the counter to be advanced by the trailing edge of that (and each succeeding) SM. The next IM finds the sector count at maximum, which results in presetting the Test Sector FF. The trailing edge of that IM, of course, reloads the Sector Counter. The ensuing SM (leading edge) clears Load Sector, while its trailing edge advances the count and clears Test Sector.

Abnormal Sequence

A Sector Mark Error can occur for two situations:

a. Index Mark appears before the Sector Counter has reached its maximum count.

b. A sector mark appears when the Sector Counter is already at maximum.

Situation 'a' will occur if a sector mark is missing (or has not been read). Situation 'b' will occur if there are more sector marks per disk revolution than are indicated by the setting of the Sector Mark switches, or if an IM pulse is missing.

Situation 'a'

The first sector mark after Index clears the Test Sector FF as usual, providing a logical 1 at the CD input to the SM Error FF. The next Index presets the Load Sector FF, as usual. The following sector mark then clears Load Sector (as usual), providing a positive-going trigger pulse that now combines with the CD input to set the SM Error FF.

Situation 'b'

A sector mark that appears when the Sector Counter is already at maximum presets the SM Error FF.

The setting of the SM Error FF for either of the situations above ensures that the Load Sector FF will be set by the leading edge of the next sector mark. This holds the Sector Counter in a Load state, which prevents the counter from advancing. The circuit is returned to normal by clearing the SM Error FF. This occurs at Index Mark time if the Address Error Bypass switch is active, or when the RESET switch is actuated. Either case forces the + Enable Sector Mark Error signal low.

UNIT SELECT/RELEASE LOGIC

The contents of Unit switches 8,4,2,1 is available in two places in the A cable: on Bus Out lines 0-3 (CR 120), and on Unit lines 2^0-2^3 (CR 124). In drives having the 60-pin A cable, the unit information is derived from the Unit lines. For 50-pin I/O drives, the Unit lines are not present, so the information must be obtained from the Bus Out lines. In either case, the Unit Select Tag (CR 124) is sent separately -- that is, not across the Bus Out lines.

With the UNIT SEL/REL switch in neutral, a forced clear is imposed on the Unit Select FF (CR 122). When the switch is raised to the SEL position, the clear is removed and a 5-ms pulse generated that sets the FF, causing the Unit Select Tag to be sent to the drive (CR124). At the same time, the pulse causes a 5-ms Unit Bus signal that selects input 3 of the Bus Out Mux (CR120), thereby gating the contents of the four UNIT switches to the Bus Out lines. (Unit lines 2^0-2^3 are static, whereas Bus Out Bits 0-3 are seen as a 5-ms pulse.)

Returning the switch to neutral drops the Unit Select Tag.

The momentary REL (Release) position of the switch is for use only in dual-access drives. Issuing the 5-ms Unit Select Tag is accomplished as described above. After another 5 milliseconds, the Release delay (CR102) times out. This causes input 2 of the Bus Out Mux to be selected (CR 120), sending the Release signal to the drive along with Tag 3. Returning the switch to neutral (center-off) drops the Tag 3 indication.

FIXED HEAD OPERATION

Three switch combinations can affect the Sel Fixed Hd FF (CR 105):

1. If FIXED • ( ) is the combination selected, the FF is preset to select only fixed heads (numbered 0-47).

2. If either MOVABLE or SMD positions are selected, the FF is force-cleared; in effect, it doesn't exist.

3. If BOTH is selected from the FTU panel, the FF will toggle with each +Clr Cyl signal issued by the CAR logic (CR 104).

Let's examine these situations in order.

PRESET -- EXERCISE FIXED HEADS ONLY

Inputs to the Hd Adrs Comparator (CR 106) will allow a maximum head address of 3. The +Sel Fixed Hd signal (CR 105) enables the +CAR 512 and +CAR 256 lines from the display mux (CR 119) to the drive, informing it to select one of 48 fixed heads, depending upon the lower two bits of HAR and the lower four bits of CAR (in the FTU).

With HAR and CAR initially cleared, fixed head 0 is selected, followed by 1, 2, and 3 as HAR advances to maximum. CAR is now advanced, HAR is cleared, and the next cycling of HAR selects fixed heads 4, 5, 6, and 7. This sequence is repeated until CAR reaches 12, whereupon a 0.475 μs +Clr Cyl pulse clears CAR (CR 104) and the entire procedure begins again.

FORCED CLEAR -- EXERCISE MOVABLE HEADS ONLY

Action is as shown in the R/W mode flowcharts. The fixed heads are not exercised in this situation.

TOGGLE -- ALTERNATELY EXERCISE MOVABLE AND FIXED HEADS

Assume that the Sel Fixed Hd FF is initially cleared, along with CAR and HAR. All movable heads are first exercised through all access positions (as determined by the access mode), starting with cylinder 0, head 0. After maximum cylinder is reached, the +Clr Cyl pulse clears CAR and toggle-sets the Sel Fixed Hd FF.

All 48 fixed heads are now exercised as described above until, when CAR reaches 12, a low-active -Clr Cyl signal (CR 104) initiates the +Clr Cyl pulse (CR 105) to clear CAR and toggle-clear the Sel Fixed Hd FF. At this point, the pattern for exercising the movable heads is again entered, and the entire sequence starts anew.

HEAD ALIGNMENT CARD (HFSV)*

The Head Alignment circuit receives the positive and negative dibit information from the Servo or Read/Write heads and processes the information to produce the offset indications. Two types of offset indications are produced: the visual indication available on the head alignment meter, and the sign information that is used by the controller during the automatic head alignment procedure. The meter reading is a halved indication of head offset expressed in microinches. Total offset is the sum of the absolute value given for both positions of the POS/NEG switch. The sign information is a changing polarity signal produced each time the FTU meter passes through zero.

The alignment card receives dibit information from either the Servo head or one of the Read/write heads depending on the position of the R/W-SERVO switch.

The received dibit information is amplified and gain scheduled such that the total of the positive and negative signal is maintained at 500 mV. A normal On Cylinder signal would contain 250 mV of positive dibit information and 250 mV of negative dibit information. If the negative dibit information decreases to 150 mV the automatic gain control circuit causes the positive dibit information to increase to 350 mV. This results in the combined output being maintained at 500 mV.

Non-AGCed Servo and Read/Write head information is fed through switching circuits and applied to the input of a minimum level detector circuit. Because the read/write head information has a lower signal level, it is gated through an additional gain stage before it is applied to the level detector. As long as the signal level is of sufficient amplitude, the output of the level detector retriggers a one-shot circuit. The time constant of the one-shot is selected so that the circuit will not time out unless the output of the level detector fails to retrigger it.

The output of the minimum level detector's one-shot is used to gate on the midpoint detector circuit. The AGCed positive and negative dibit signals are biased above and below the zero threshold. When the two out of phase signals reached the zero point simultaneously, they turn on the midpoint detector. The output of the midpoint detector drives two one-shot circuits. The one-shots are retriggered by the second midpoint pulse before they time out. The time out of the one-shots is the Read Gate for the Peak Detector circuits.

* TB304A/B only

The Peak Detector circuit alternately detects the positive and negative dibit peak amplitudes. These peaks are used to charge up two capacitors. The difference in potential between the two capacitors represents the amount and the direction of the head offset. The two capacitors drive a differential amplifier. The amplifier output is then scaled and limited and used to drive the head alignment meter.

SECTION 4

MAINTENANCE

POWER SUPPLY VOLTAGE CHECKS

Two 5 V power supplies provide overvoltage protection that drops the output voltages to about 1 volt if the supply voltage should exceed approximately 6.5 volts. The exact point at which the drop in output occurs is preset at the factory with no load on the supply. In addition, each supply has a Voltage Adjust pot to set the full-load output voltage to 5 V, ±0.5 V. The location of these four potentiometers is shown in CR500 of the Diagrams section.

Holes in the front wall of the power supply compartment allow access for screwdriver adjustment of the two +5 V pots. The -5 V pots may be adjusted by using the finger tips to turn the blue plastic disk attached to the shaft of each potentiometer.

NOTE

Don't capriciously tweak the factory-set Overvoltage pots. Not only can the overvoltage protection be lost if the shaft is turned one way, but also, if the shaft is rotated the other way, premature protection may be invoked that will cause the output to drop off before the supply reaches its operating voltage. The Overvoltage Adjustment procedure given below is for those relatively rare occasions where the procedure is absolutely necessary.

OVERVOLTAGE ADJUSTMENT PROCEDURE

1. Turn off the FTU and remove the cover from the power supply compartment.
2. Disconnect the red (+5 V) wires going to the logic board and control panel from A1TB1-8. Do not disconnect the red wire coming from the +5 V.
3. Turn the +5 V Overvoltage pot fully counter clockwise (to raise the overvoltage sense beyond the range of the +5 V supply, essentially negating any regulatory actions.)
4. Turn the +5 V Voltage Adjust pot fully counter-clockwise to minimize the output voltage.
5. Turn on the FTU.
6. Connect the ground probe of a VOM to a convenient ground in the FTU case.
7. Slip the other VOM probe under the screw of A1TB1-8; tighten the screw to hold the probe.
8. Observing the VOM, turn the +5 V Voltage Adjust pot until the meter registers +6.5 V.
9. Still observing the VOM, turn the Overvoltage pot slowly clockwise until the meter shows an abrupt drop from +6.5 V to about +1 volt.
10. Turn down the Voltage Adjust pot so the meter reads +5 V. (This reading will probably change when a load is later applied to the supply.)
11. Turn off the FTU, reconnect the red wires to A1TB1-8.

Repeat steps 2 through 11 for the -5 V supply if necessary, using the blue wires, A1TB1-7, and minus voltages.

NOTE

After performing the Overvoltage Adjustment, it is necessary to re-adjust the supply voltage under load, as shown in the Voltage Adjustment below.

VOLTAGE ADJUSTMENT PROCEDURE

1. Remove the cover to the power supply compartment, if this was not done as part of the Overvoltage Adjustment procedure.
2. Connect the ground probe of a VOM to the FTU ground stud or some other convenient logical ground; connect the other probe to A1TB1-8, for +5 V adjustment, or to A1TB1-7 for -5 V adjustment.
3. While observing the VOM, turn the Voltage Adjust potentiometer on the requisite supply until the meter reads 5 V, ±0.5 V.
4. Repeat steps 2 and 3 for the other supply.
5. Replace the cover to the power supply compartment.

TROUBLESHOOTING THE FTU LOGIC

GENERAL

When using the TB304 to troubleshoot problems in the drive, it would be reassuring to know that the tester is functioning properly; that is, that the drive is not adding FTU errors to the pattern it writes or reads on the scratch pack. That is why the Operation section stressed the need to perform repeatedly any exercise that caused error stops, in order to pin-point the drive, the scratch pack, the I/O cabling, or the FTU as the source of the problem.

The flowcharts in section 3 show the sequencing of signals and commands to most FF's and registers in the FTU for each access and R/W mode. The diagrams in section 5 are arranged functionally to minimize jumping from page to page while tracing a circuit. As a result, a break in the flow of a signal or command between two flowchart points may be easily related to the gates and inverters between those points. These elements will most always appear on one or the other of the diagrams denoted by the cross-reference numbers above the respective flowchart symbols.

Remember that with the Maintenance/Normal switch in MAINT, all lines from the drive are active with the exception of Read Clock, Read Data, and Unit Ready (which is artificially generated in Maintenance mode), and that the write functions are not impeded. The above statement assumes, of course, that the A and B cables are connected to the drive.

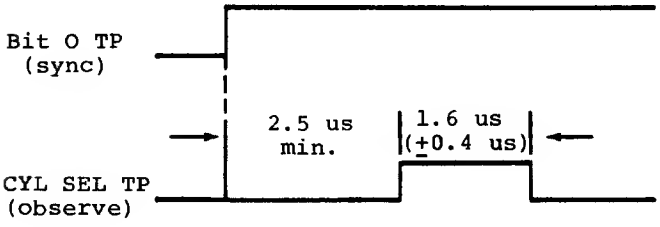
USING THE TEST POINTS

The stylized waveforms below should help in determining whether or not the FTU is performing properly. Not all test points on the panel are shown, but the method of operation may be extended to those not included.

Cylinder Select

Access Mode	CONT
Cyl Addr Sw	Bit 1 ON (up), others OFF

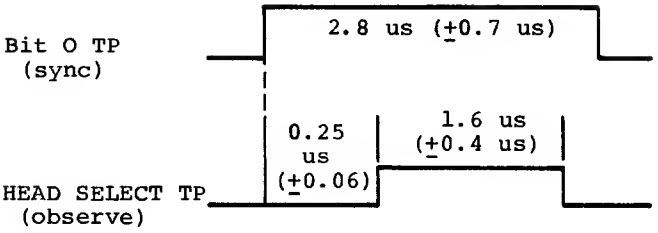
Actuate RTZ, then START. Drive alternates between cylinders 0 and 1.



Head Select

Access Mode	DIRECT
Wrt-Rd Select	WRT FORMAT
Seq/Man	MAN
Head Addr	Bit 1 ON (up), others OFF

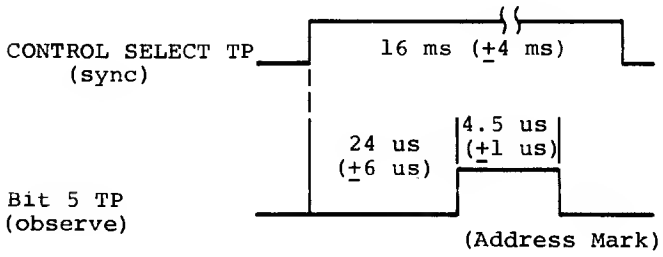
Actuate START.



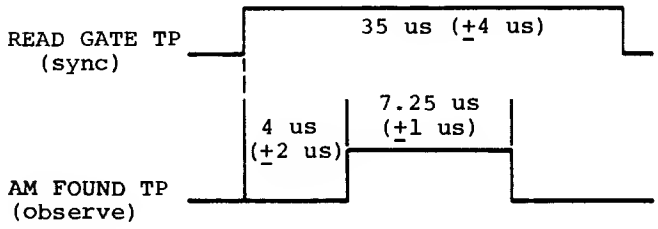
Address Mark

Access Mode	DIRECT
Wrt-Rd Select	WRT FORMAT
Seq/Man	MAN
Addr Mk/Sector Mk	ADDR MK

Actuate START.



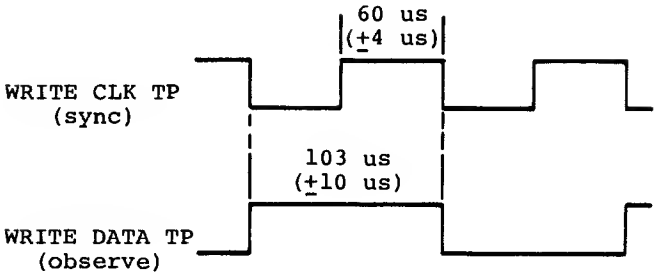
Actuate STOP. Place Wrt-Rd Select switch to WRT. Actuate START.



Write Clock/Data

Access Mode	DIRECT
Wrt-Rd Select	WRT
Data Pattern Sw	10 101 010 pattern

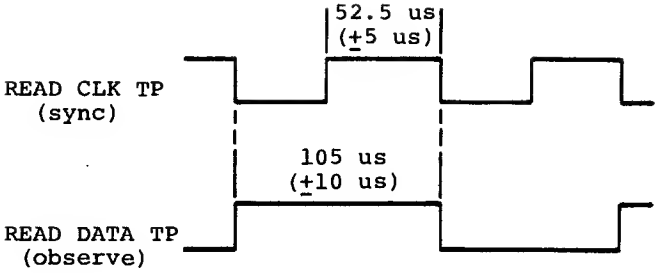
Actuate START.



Read Clock/Data

Access Mode	DIRECT
Wrt-Rd Select	READ
Data Pattern Sw	(as for Write Clock/ Data, above)

Actuate START.



Read Gate/Write Gate

The Read Gate and Write Gate test points offer a rough index of the FTU's operation. When syncing on Index Mark, the R/W gate TP's should not deviate by more than 10% from the norms shown in figure 3-7.

SECTION 5

DIAGRAMS

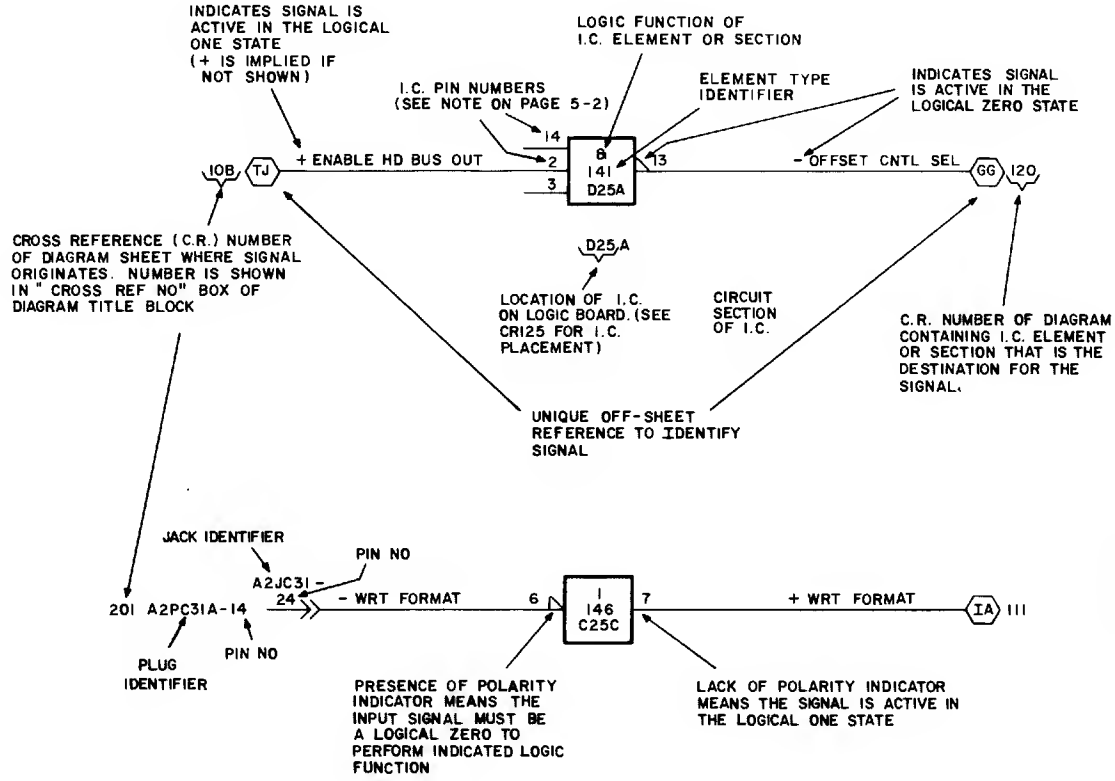
This section contains the logic, cabling, and power diagrams for the TB304B/C and the TB304A. Yellow divider sheets identify the two diagram sets. The cross-reference numbers described below are duplicated for each set, except as indicated.

Cross-reference numbers for the diagrams fall into seven number series, as shown below. The first sheet in a series is usually a "locator" diagram that shows the physical arrangement of the electrical components within that series. A map of the logic board (IC placement) is given on CR sheet 125.

CR Series	Is Concerned With
010 (1)	Key to Logic
100	Logic Diagrams
200	Logic Board/Control Panel Cabling
300	Panel Switches, Indicators, Test Points
400	I/O Cables
500 (2)	Power Supply
600 (2)	Type HFSV Head Alignment Card

(1) Found in front of TB304B/C divider, this series is common to both diagram sets.

(2) Shown only with the TB304B/C diagram set, but applicable to the TB304A as well.

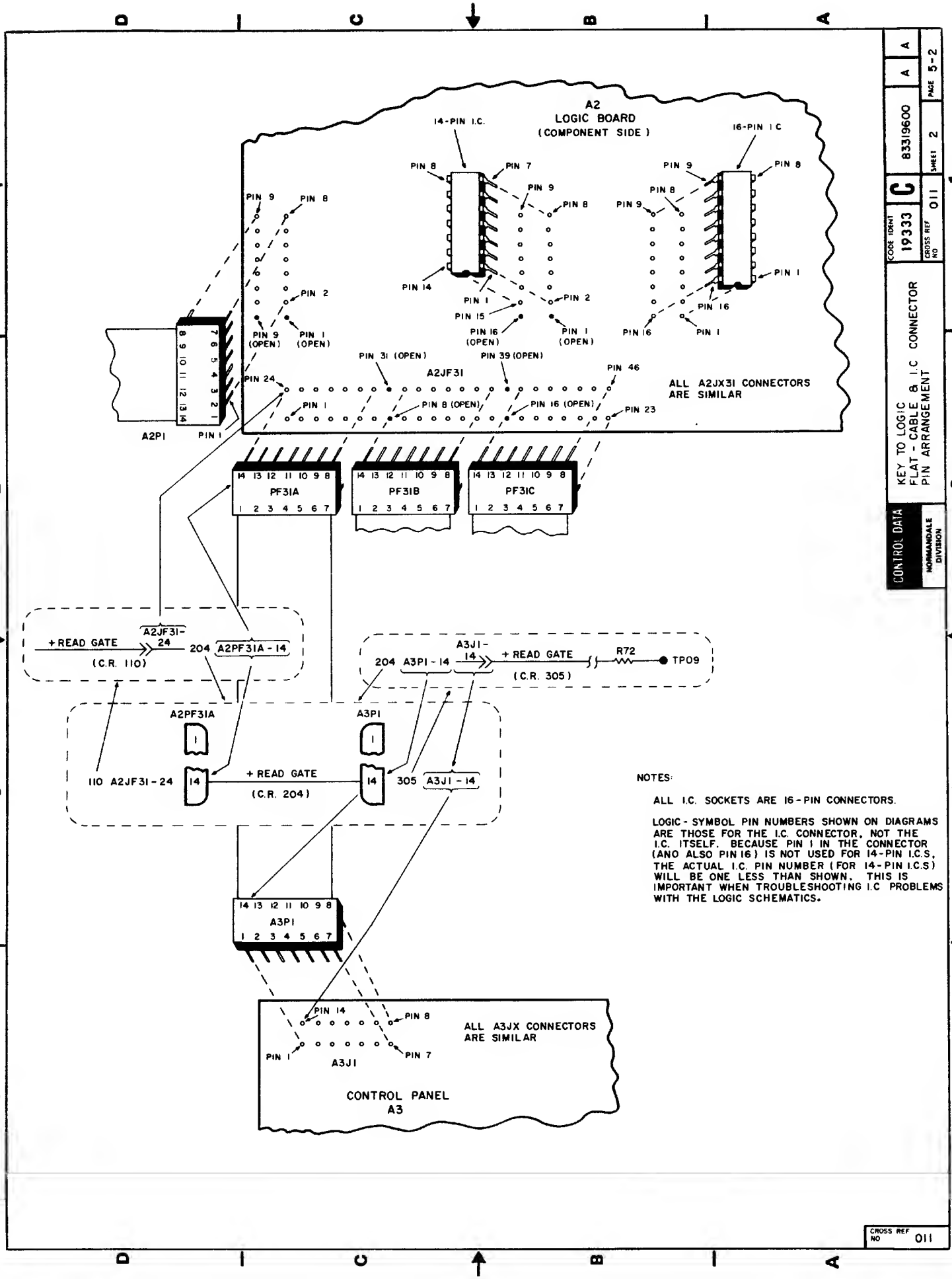


ABBREVIATIONS USED ON LOGIC DIAGRAMS

ADRS	ADDRESS	MK	MARK
ALTN	ALTERNATE	MUX	MULTIPLEXER / SELECTOR
CHAR	CHARACTER	RAND	RANDOM
CLK	CLOCK	RD	READ
CNT(R)	COUNT (COUNTER)	REL DLY	RELEASE DELAY
CNTL	CONTROL	RTZ	RETURN TO ZERO
CONT	CONTINUOUS	SEL	SELECT
CYL	CYLINDER	SEQ	SEQUENTIAL
DIR	DIRECT	STR	STROBE
DSO	DIRECT SEEK ONLY	T1	TIME 1
HD	HEAD	⋮	⋮
INCR	INCREMENT (INCREASE BY 1)	T7	TIME 7
MAN	MANUAL	WRT	WRITE

TB304B/C

DIAGRAMS



NOTES:

ALL I.C. SOCKETS ARE 16-PIN CONNECTORS.

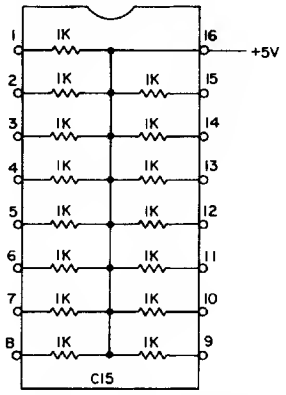
LOGIC-SYMBOL PIN NUMBERS SHOWN ON DIAGRAMS ARE THOSE FOR THE I.C. CONNECTOR, NOT THE I.C. ITSELF. BECAUSE PIN 1 IN THE CONNECTOR (AND ALSO PIN 16) IS NOT USED FOR 14-PIN I.C.S, THE ACTUAL I.C. PIN NUMBER (FOR 14-PIN I.C.S) WILL BE ONE LESS THAN SHOWN. THIS IS IMPORTANT WHEN TROUBLESHOOTING I.C PROBLEMS WITH THE LOGIC SCHEMATICS.

CONTROL DATA
NORMANDALE DIVISION

KEY TO LOGIC
FLAT-CABLE & I.C CONNECTOR
PIN ARRANGEMENT

CODE IDENT 19333 | C | 83319600 | A | A
CROSS REF NO 011 | SHEET 2 | PAGE 5-2

HEADER CHIP CONNECTORS

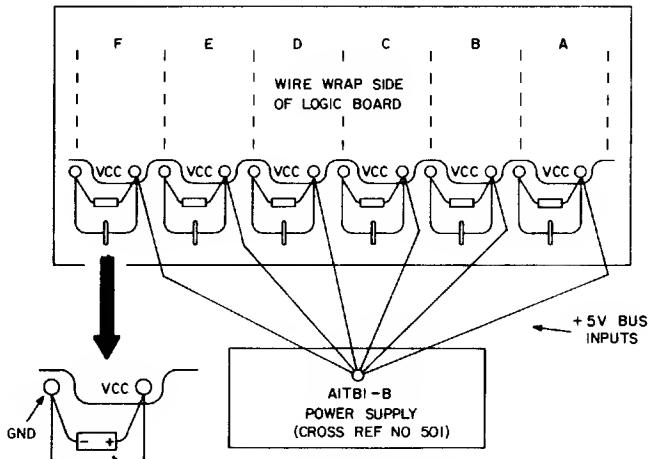


ALL IK RESISTORS FOUND IN THESE DIAGRAMS ARE LOCATED ON THIS HEADER CHIP (UNLESS OTHERWISE SPECIFIED) WHICH IK RESISTOR IS BEING REFERRED IS DETERMINED BY TRACING THE WIREWRAP CONNECTIONS (VIA THE LOGIC WIRELIST) BACK TO THIS HEADER CHIP

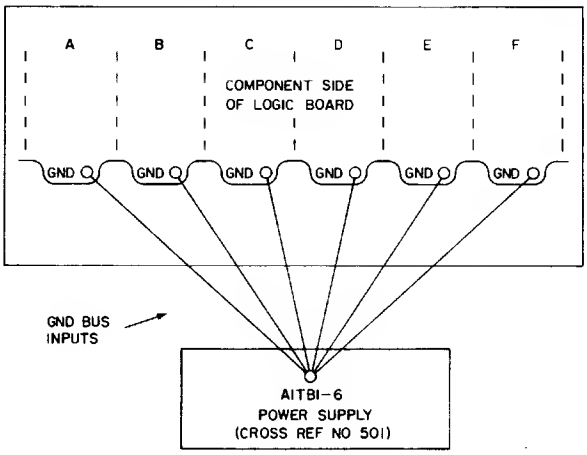
NOTES

1 THE FOLLOWING SHEETS ARE THE LOGICAL DIAGRAMS FOR THE LOGIC (WIREWRAP) BOARD

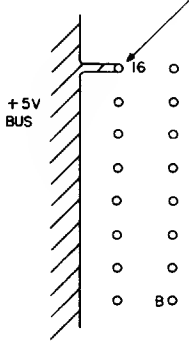
POWER CONNECTIONS



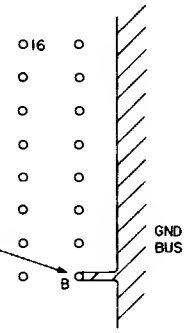
GROUND CONNECTIONS



PIN 16 OF EACH CHIP LOCATION CONNECTS TO +5V BUS EXCEPT AT CHIP LOCATIONS A01, A02, A03, A04, A06, AND A20



PIN 8 OF EACH CHIP LOCATION CONNECTS TO GND BUS EXCEPT AT CHIP LOCATIONS A01, A02, A03, A04, A19, D04, F01, AND F06

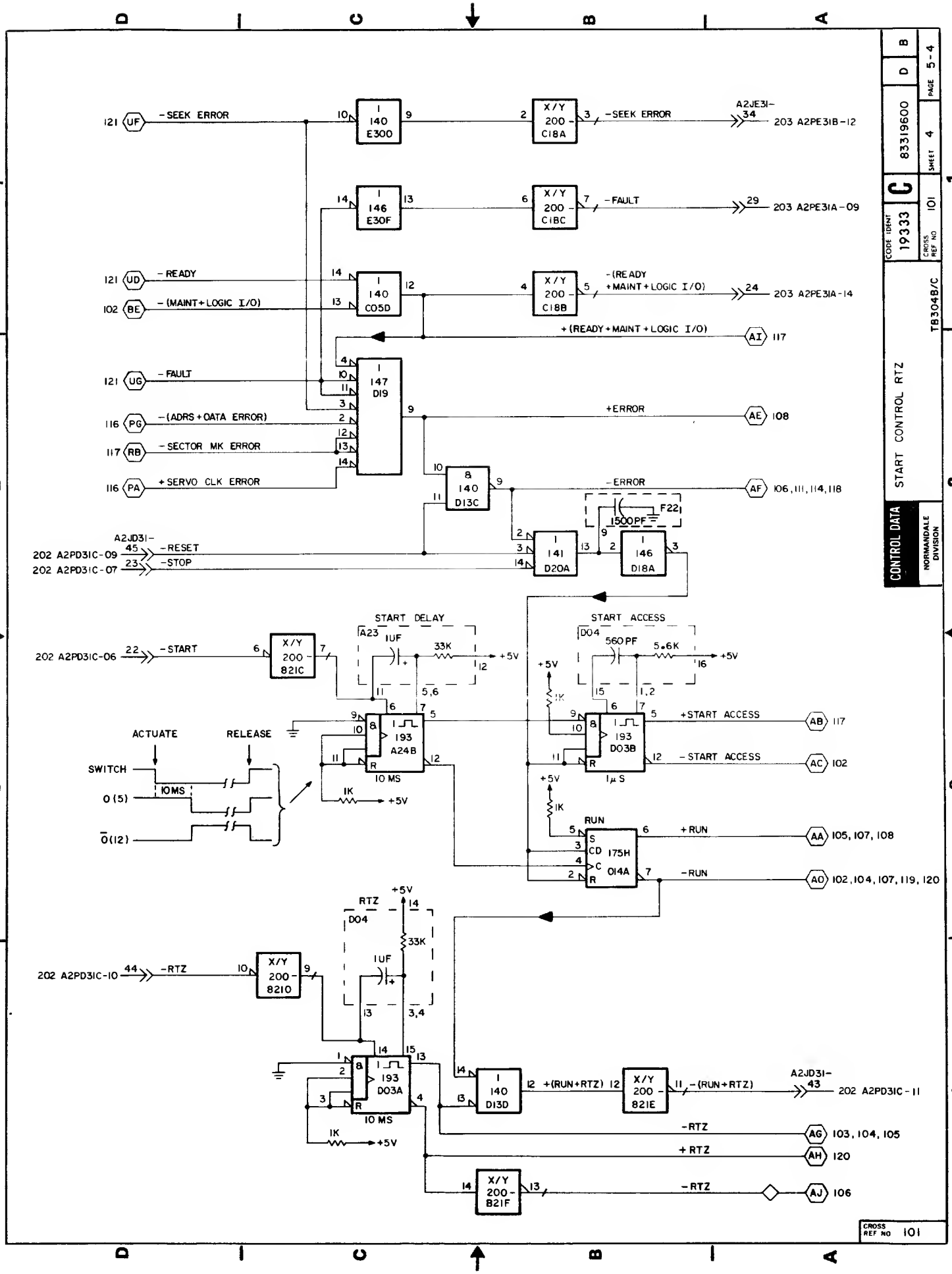


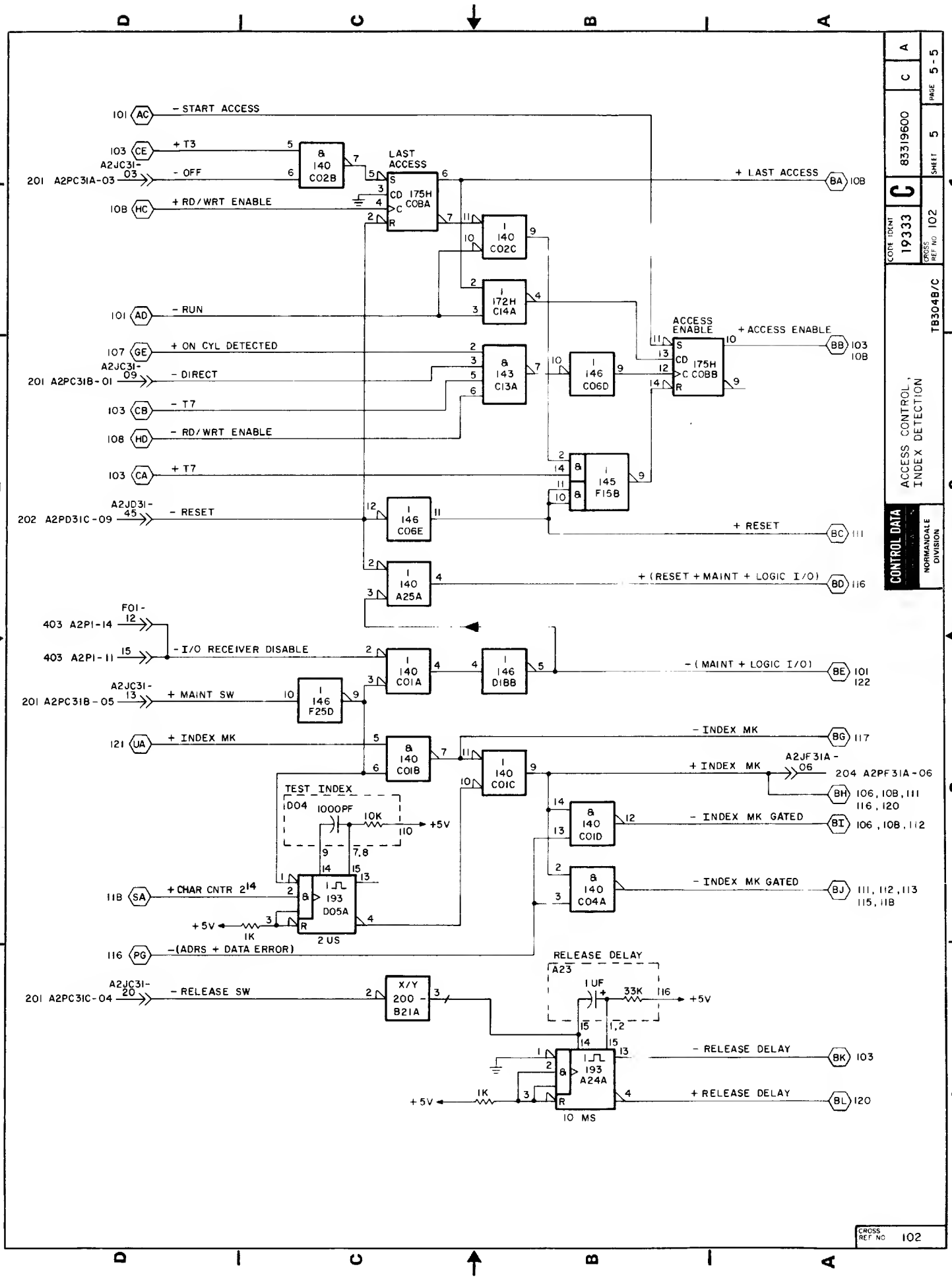
CONTROL DATA NORMANDALE DIVISION

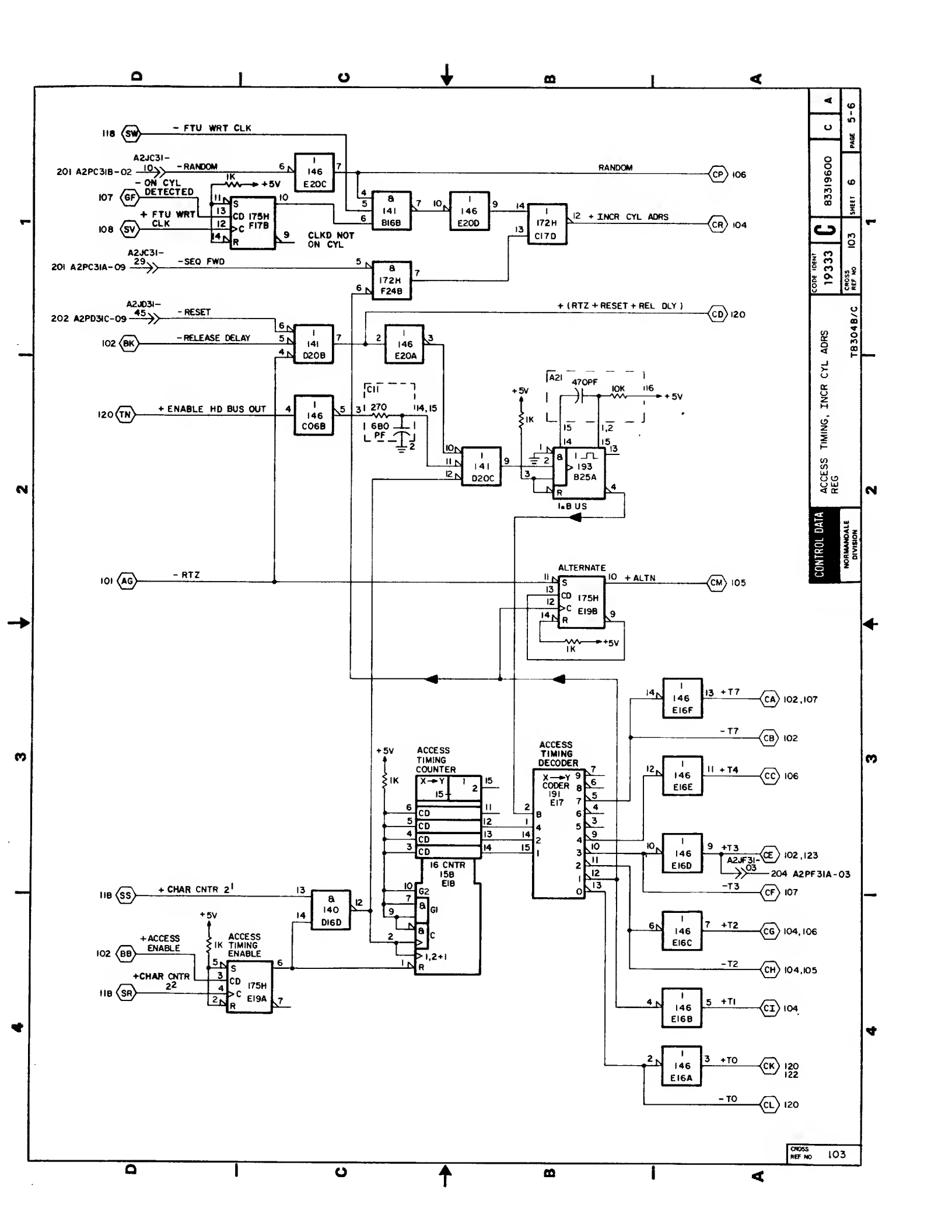
LOGIC BOARD TB304B/C

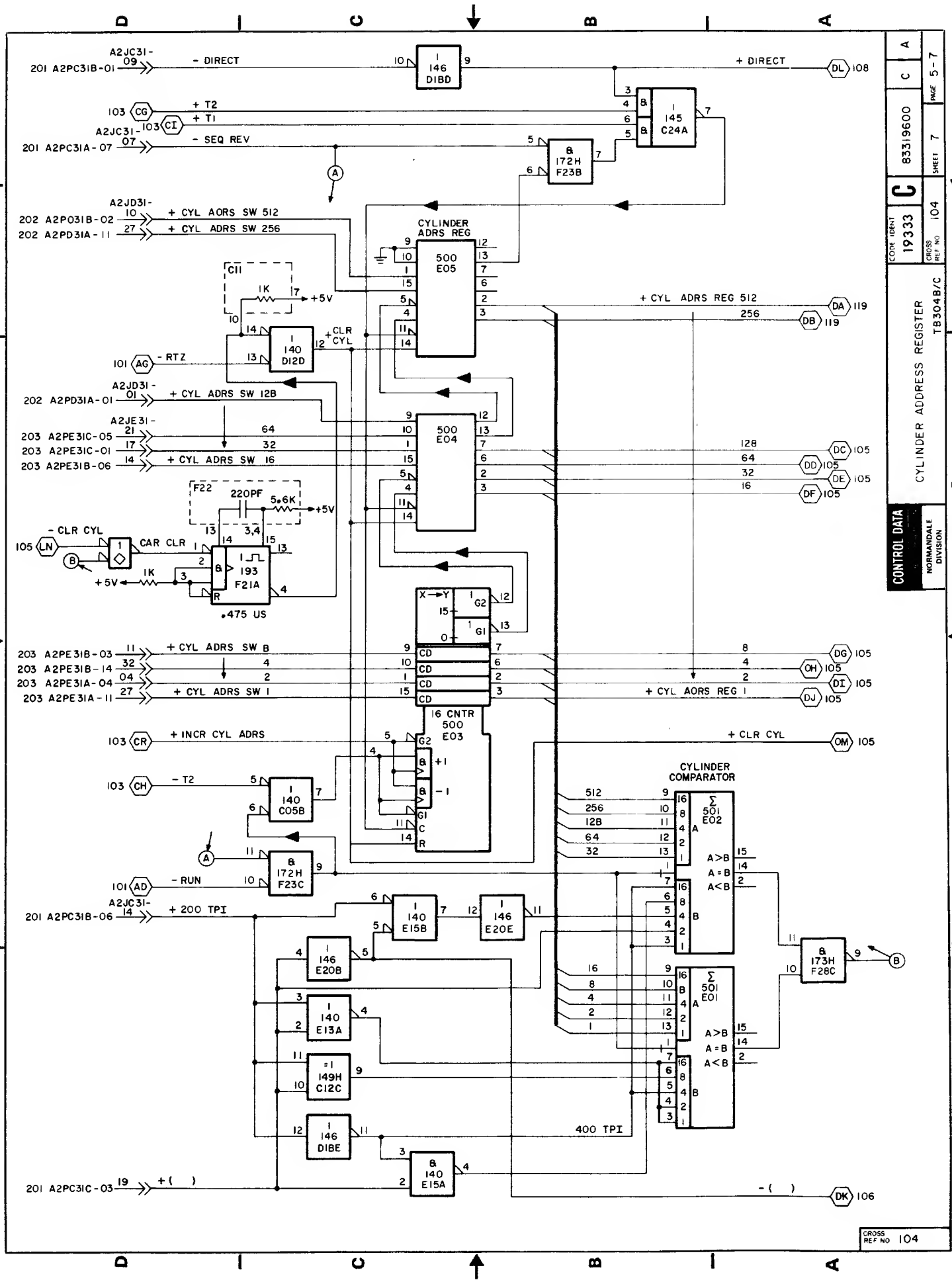
CODE IDENT 19333 | CROSS REF NO 100 | C | 833I9600 | SHEET 3 | C | A | PAGE 5-3

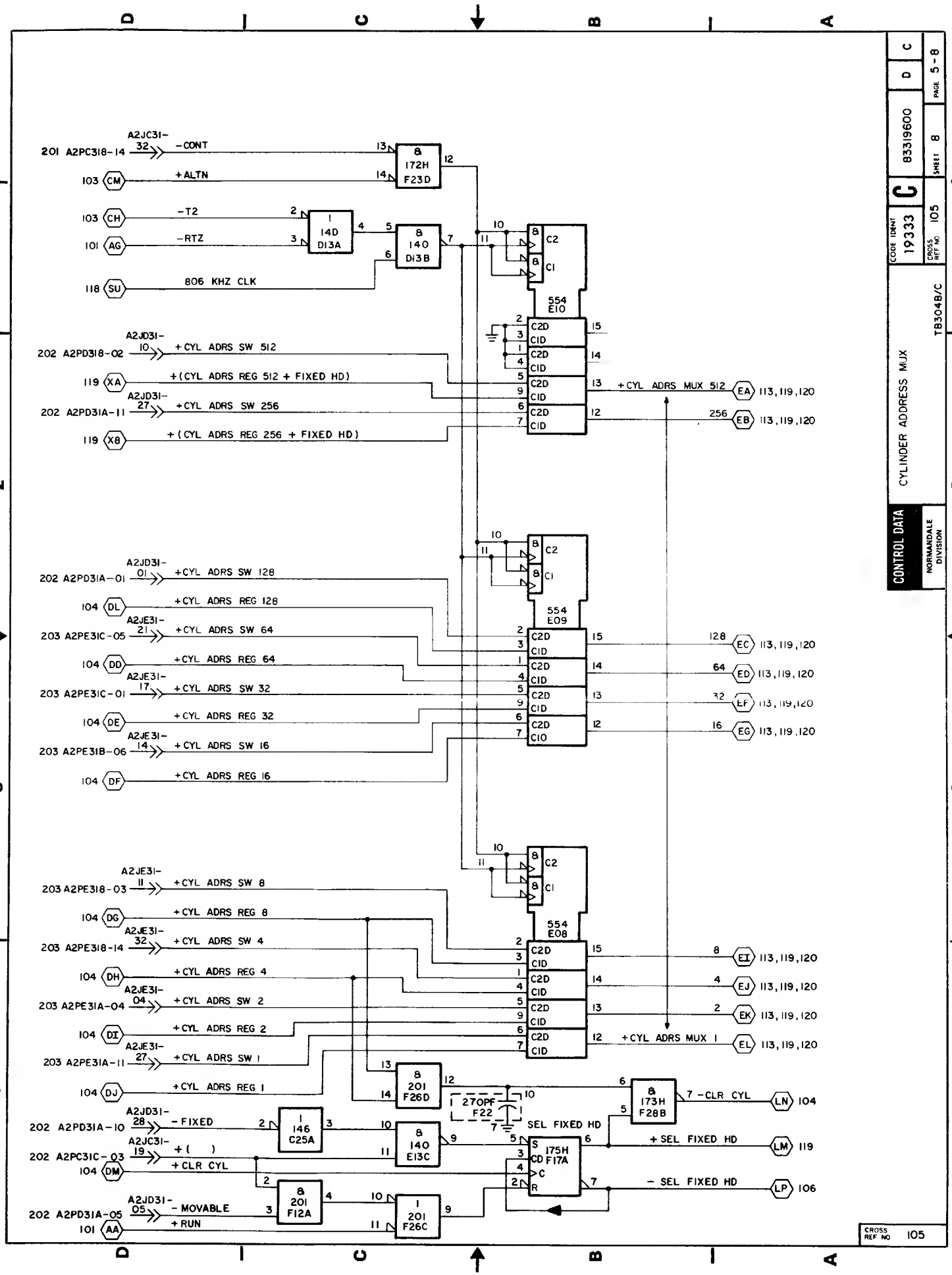
CROSS REF NO 100

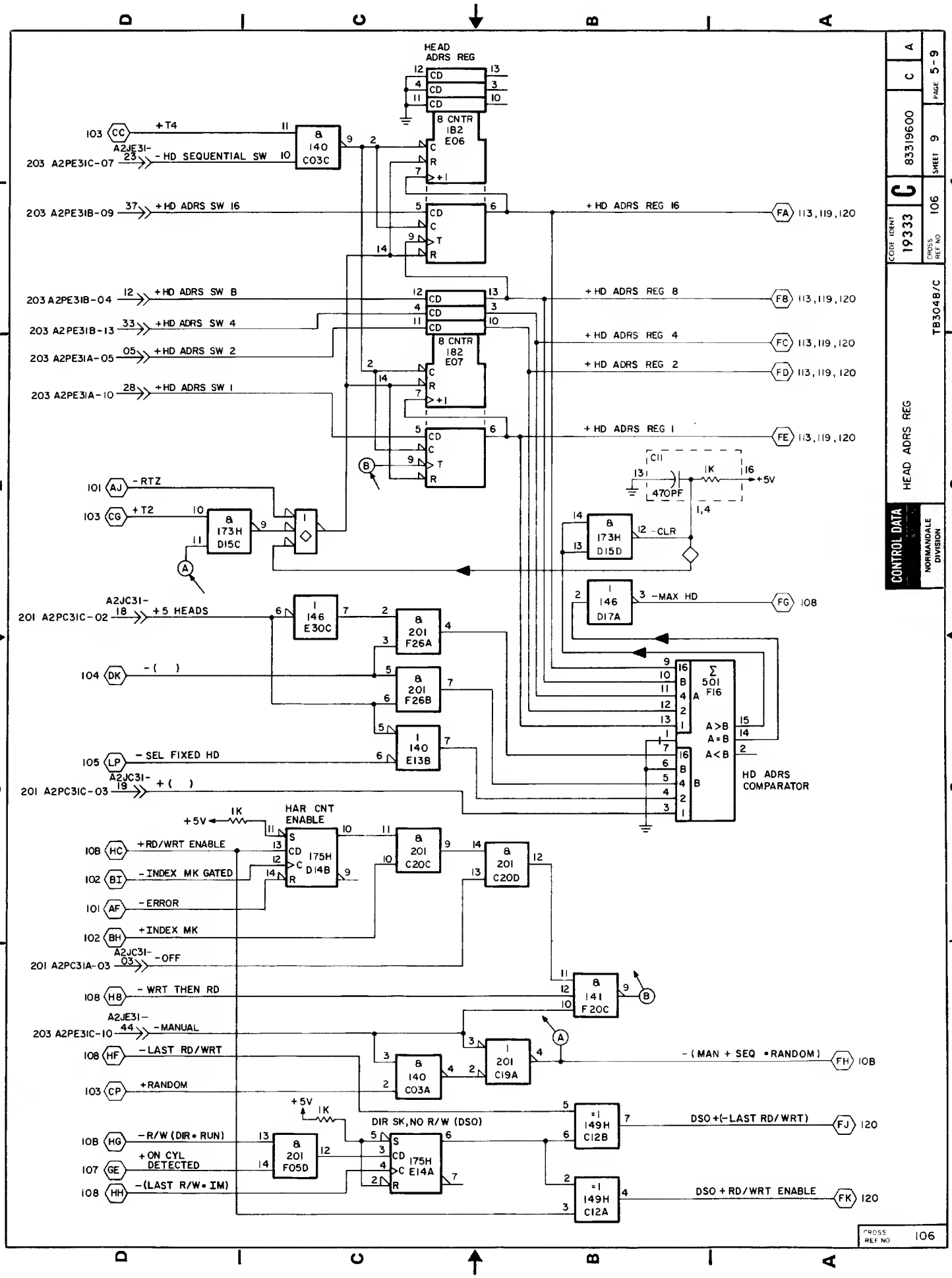

121 UF -SEEK ERROR
I 140 E300
X/Y 200 - C18A
-SEEK ERROR
A2JE31- 34
203 A2PE31B-12
I 146 E30F
X/Y 200 - C18C
-FAULT
29
203 A2PE31A-09
121 UD -READY
102 BE -(MAINT+LOGIC I/O)
I 140 C05D
X/Y 200 - C18B
-(READY +MAINT+LOGIC I/O)
24
203 A2PE31A-14
+(READY+MAINT+LOGIC I/O)
AI 117
121 UG -FAULT
116 PG -(ADRS+DATA ERROR)
117 RB -SECTOR MK ERROR
116 PA +SERVO CLK ERROR
I 147 D19
+ERROR
AE 108
8 140 D13C
-ERROR
AF 106,111,114,118
F22 1500PF
A2JD31-
202 A2PD31C-09 -RESET
202 A2PD31C-07 -STOP
I 141 D20A
I 146 D18A
START DELAY
A23 1UF 33K +5V
START ACCESS
D04 560PF 5.6K +5V
202 A2PD31C-06 -START
X/Y 200 - 821C
ACTUATE
RELEASE
SWITCH
0(5)
0(12)
10MS
I 193 A24B
10 MS
1K +5V
I 193 D03B
1 μS
+START ACCESS
AB 117
-START ACCESS
AC 102
RUN
S CD 175H C R
014A
+RUN
AA 105,107,108
-RUN
AO 102,104,107,119,120
RTZ
D04 33K 1UF
202 A2PD31C-10 -RTZ
X/Y 200 - 8210
I 193 D03A
10 MS
I 140 D13D
+(RUN+RTZ)
X/Y 200 - 821E
-(RUN+RTZ)
A2JD31- 43
202 A2PD31C-11
-RTZ
AG 103,104,105
+RTZ
AH 120
X/Y 200 - 821F
-RTZ
AJ 106
CROSS REF NO 101
CONTROL DATA
NORMANDALE DIVISION
START CONTROL RTZ
TB3048/C
CODE IDENT 19333
CROSS REF NO 101
C
83319600
SHEET 4
PAGE 5-4
D
B

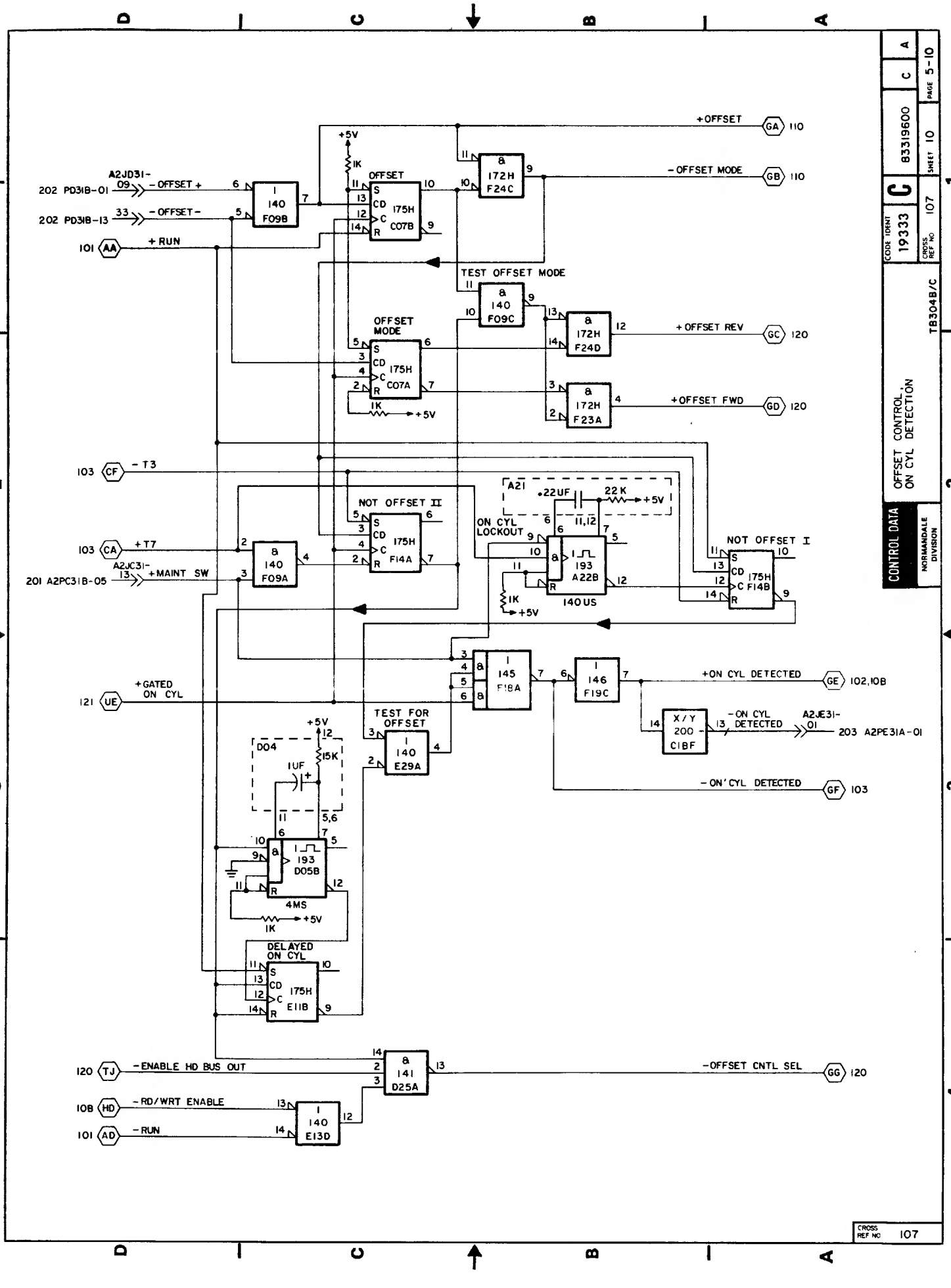

- START ACCESS
+ T3
- OFF
+ RD/WRT ENABLE
LAST ACCESS
+ LAST ACCESS
- RUN
+ ON CYL DETECTED
- DIRECT
- T7
- RD/WRT ENABLE
+ T7
- RESET
ACCESS ENABLE
+ ACCESS ENABLE
+ RESET
+ (RESET + MAINT + LOGIC I/O)
- I/O RECEIVER DISABLE
+ MAINT SW
- (MAINT + LOGIC I/O)
+ INDEX MK
- INDEX MK
+ INDEX MK
- INDEX MK GATED
- INDEX MK GATED
TEST INDEX
1000PF
10K
+5V
+ CHAR CNTR 2^14
2 US
-(ADRS + DATA ERROR)
RELEASE DELAY
A23
1 UF
33K
- RELEASE SW
- RELEASE DELAY
+ RELEASE DELAY
10 MS
ACCESS CONTROL, INDEX DETECTION
TB3048B/C
CONTROL DATA
NORMANDALE DIVISION
83319600
CODE IDENT 19333
CROSS REF NO 102
SHEET 5
PAGE 5-5
CROSS REF NO 102

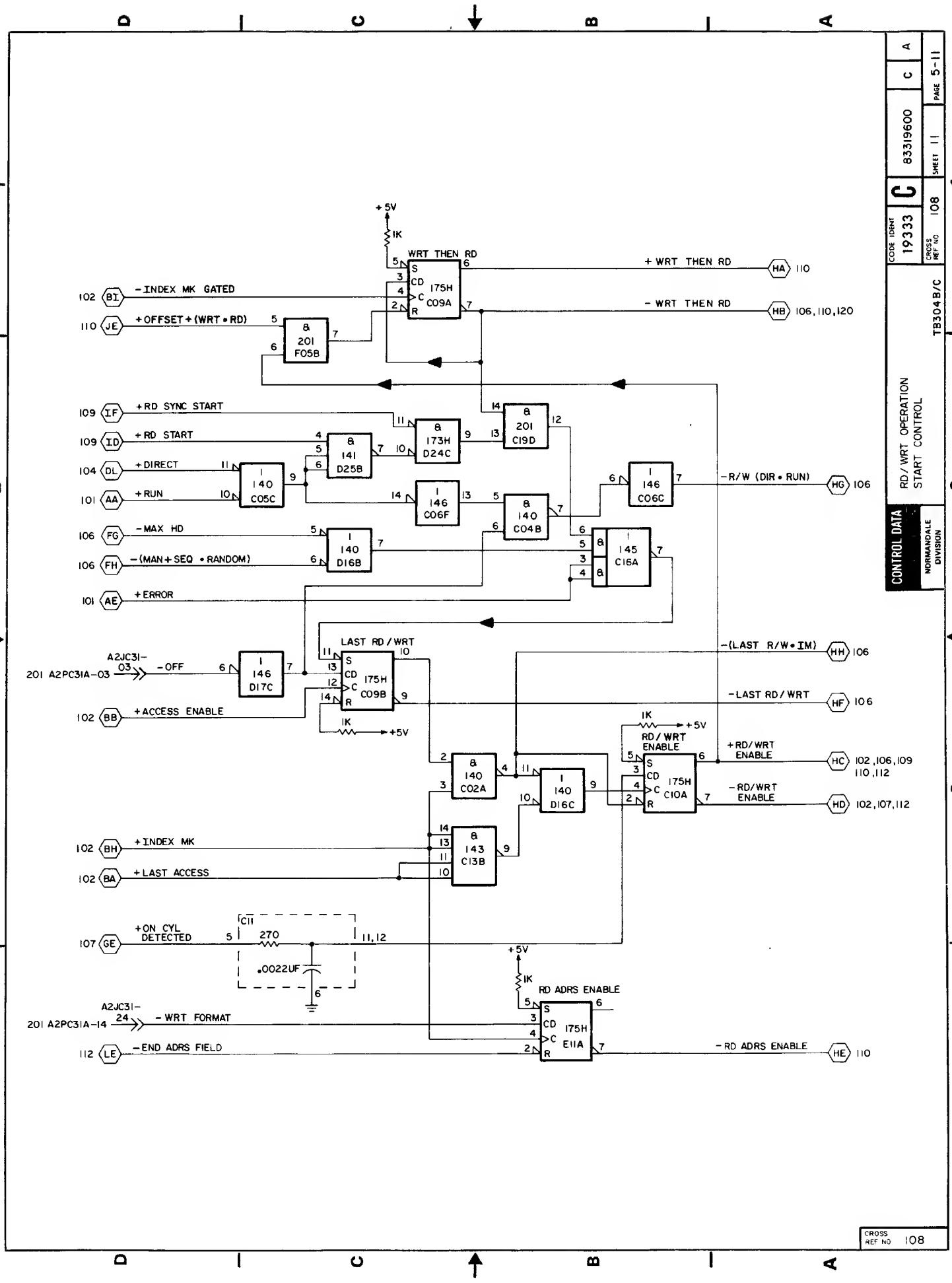

- FTU WRT CLK
A2JC31-10
-RANDOM
- ON CYL DETECTED
+ FTU WRT CLK
1K
+5V
CD 175H F17B
CLKD NOT ON CYL
RANDOM
+ INCR CYL ADRS
A2JC31-29
-SEQ FWD
A2JD31-45
-RESET
-RELEASE DELAY
+ (RTZ + RESET + REL DLY)
+ ENABLE HD BUS OUT
C11
270
680 PF
A21
470PF
10K
193 B25A
1.8 US
- RTZ
ALTERNATE
+ ALTN
CD 175H E19B
ACCESS TIMING COUNTER
16 CNTR 15B E18
ACCESS TIMING DECODER
CODER 191 E17
+ CHAR CNTR 2^1
+ACCESS ENABLE
ACCESS TIMING ENABLE
+CHAR CNTR 2^2
CD 175H E19A
+T7
-T7
+T4
+T3
-T3
+T2
-T2
+T1
+T0
-T0
A2JF31-03
204 A2PF31A-03
CONTROL DATA
NORMANDALE DIVISION
ACCESS TIMING, INCR CYL ADRS REG
T8304B/C
CODE IDENT 19333
C
83319600
SHEET 6
PAGE 5-6
CROSS REF NO 103

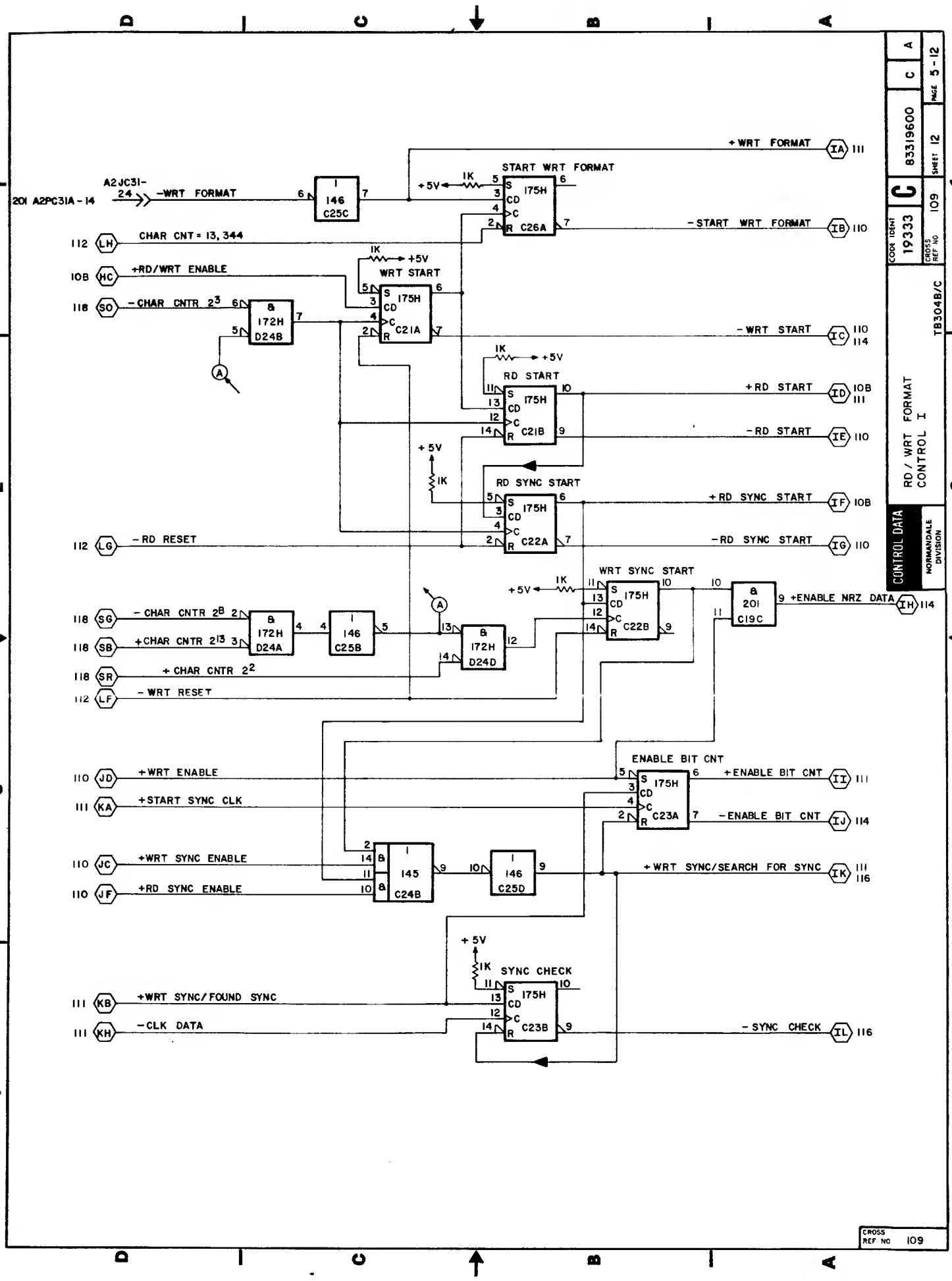

CONTROL DATA
NORMANDALE DIVISION
CYLINDER ADDRESS REGISTER
TB3048B/C
CODE IDENT 19333
C
83319600
SHEET 7
PAGE 5-7
CROSS REF NO 104
CYLINDER ADRS REG
CYLINDER COMPARATOR
16 CNTR 500 E03
+ DIRECT
- DIRECT
+ T2
+ T1
- SEQ REV
+ CYL ADRS SW 512
+ CYL ADRS SW 256
+ CYL ADRS SW 128
+ CYL ADRS SW 64
+ CYL ADRS SW 32
+ CYL ADRS SW 16
+ CYL ADRS SW 8
+ CYL ADRS SW 1
+ CYL ADRS REG 512
256
128
64
32
16
+ CYL ADRS REG 1
+ CLR CYL
- CLR CYL
CAR CLR
- RTZ
+ INCR CYL ADRS
- T2
- RUN
+ 200 TPI
400 TPI
+5V
1K
220PF
5.6K
.475 US
A>B
A=B
A<B

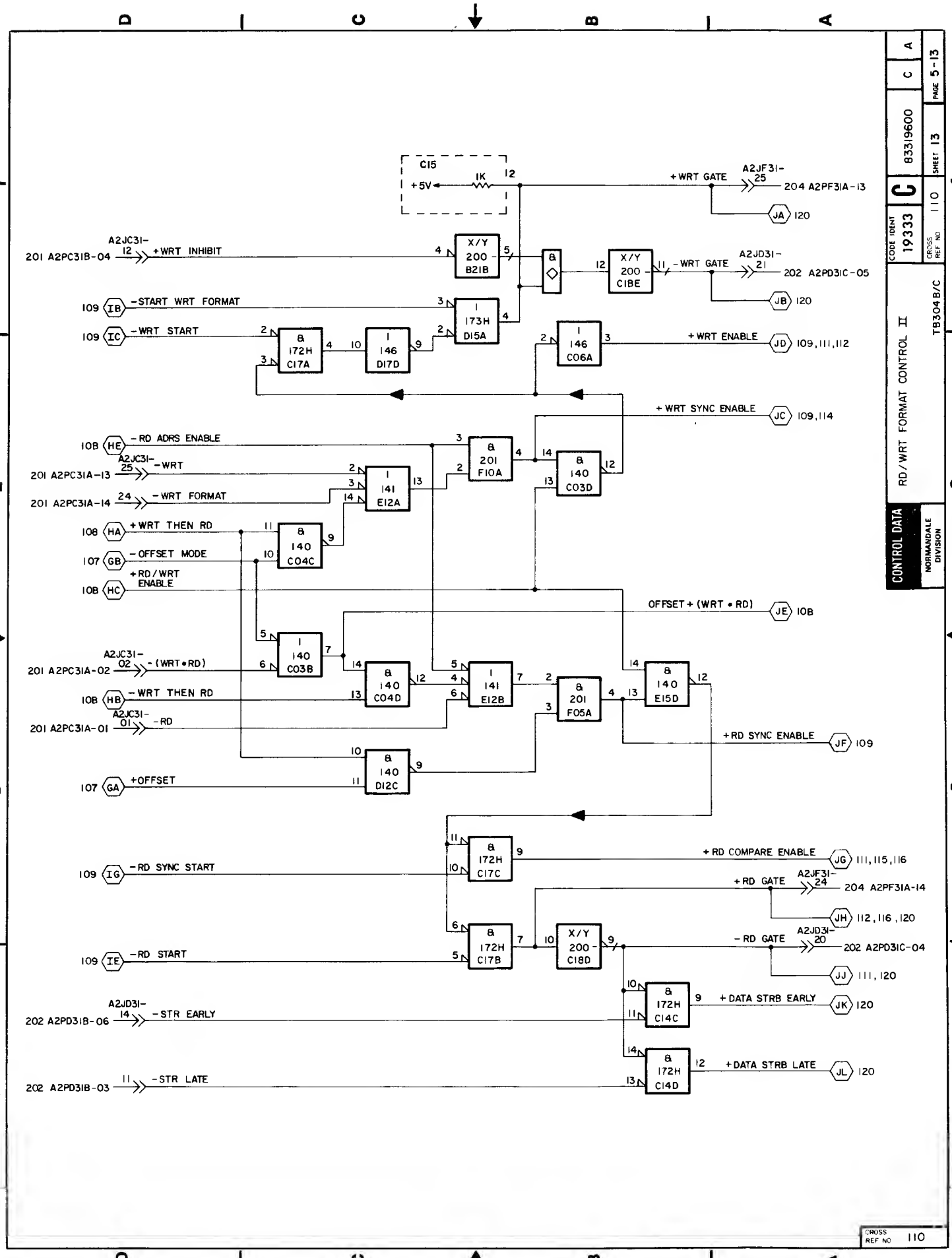

CONTROL DATA
NORMANDALE DIVISION
CYLINDER ADDRESS MUX
T83048/C
CODE IDENT 19333
C
83319600
SHEET 8
PAGE 5-8
CROSS REF NO 105
A2JC31-32 -CONT
201 A2PC318-14
103 CM +ALTN
8 172H F23D
103 CH -T2
101 AG -RTZ
1 14D D13A
8 140 D13B
118 SU 806 KHZ CLK
554 E10
A2JD31-10 +CYL ADRS SW 512
202 A2PD318-02
119 XA +(CYL ADRS REG 512 + FIXED HD)
A2JD31-27 +CYL ADRS SW 256
202 A2PD31A-11
119 X8 +(CYL ADRS REG 256 + FIXED HD)
+CYL ADRS MUX 512 EA 113,119,120
256 EB 113,119,120
554 E09
A2JD31-01 +CYL ADRS SW 128
202 A2PD31A-01
104 DL +CYL ADRS REG 128
A2JE31-21 +CYL ADRS SW 64
203 A2PE31C-05
104 DD +CYL ADRS REG 64
A2JE31-17 +CYL ADRS SW 32
203 A2PE31C-01
104 DE +CYL ADRS REG 32
A2JE31-14 +CYL ADRS SW 16
203 A2PE31B-06
104 DF +CYL ADRS REG 16
128 EC 113,119,120
64 ED 113,119,120
32 EF 113,119,120
16 EG 113,119,120
554 E08
A2JE31-11 +CYL ADRS SW 8
203 A2PE318-03
104 DG +CYL ADRS REG 8
A2JE31-32 +CYL ADRS SW 4
203 A2PE318-14
104 DH +CYL ADRS REG 4
A2JE31-04 +CYL ADRS SW 2
203 A2PE31A-04
104 DI +CYL ADRS REG 2
A2JE31-27 +CYL ADRS SW 1
203 A2PE31A-11
104 DJ +CYL ADRS REG 1
8 EI 113,119,120
4 EJ 113,119,120
2 EK 113,119,120
+CYL ADRS MUX 1 EL 113,119,120
8 201 F26D
270PF F22
8 173H F28B
7 -CLR CYL LN 104
A2JD31-28 -FIXED
202 A2PD31A-10
1 146 C25A
8 140 E13C
SEL FIXED HD
+SEL FIXED HD LM 119
A2JC31-19 +( )
202 A2PC31C-03
104 DM +CLR CYL
175H F17A
- SEL FIXED HD LP 106
A2JD31-05 -MOVABLE
202 A2PD31A-05
101 AA +RUN
8 201 F12A
1 201 F26C
CROSS REF NO 105

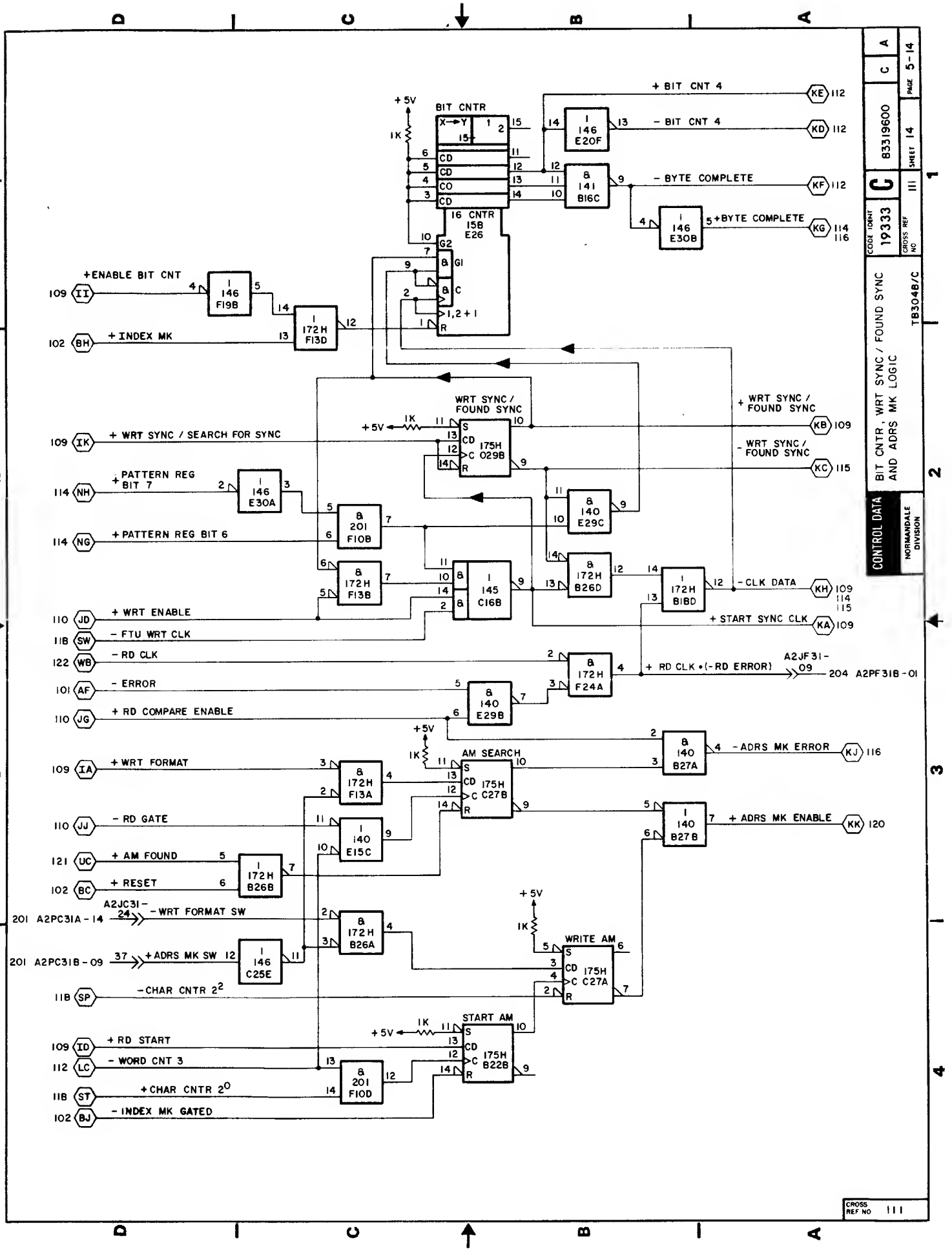

HEAD ADRS REG
8 CNTR 182 E06
8 CNTR 182 E07
103 CC +T4
A2JE31-23 203 A2PE31C-07 - HD SEQUENTIAL SW
8 140 C03C
203 A2PE31B-09 37 +HD ADRS SW 16
+HD ADRS REG 16 FA 113,119,120
203 A2PE31B-04 12 +HD ADRS SW 8
+HD ADRS REG 8 FB 113,119,120
203 A2PE31B-13 33 +HD ADRS SW 4
+HD ADRS REG 4 FC 113,119,120
203 A2PE31A-05 05 +HD ADRS SW 2
+HD ADRS REG 2 FD 113,119,120
203 A2PE31A-10 28 +HD ADRS SW 1
+HD ADRS REG 1 FE 113,119,120
C11 470PF 1K +5V
101 AJ -RTZ
103 CG +T2
8 173H D15C
8 173H D15D -CLR
A2JC31-18 201 A2PC31C-02 +5 HEADS
1 146 E30C
8 201 F26A
104 DK -( )
8 201 F26B
1 140 E13B
105 LP - SEL FIXED HD
A2JC31-19 201 A2PC31C-03 +( )
1 146 D17A 3 -MAX HD FG 108
Σ 501 F16
A>B A=B A<B
HD ADRS COMPARATOR
+5V 1K
HAR CNT ENABLE
175H D14B
108 HC +RD/WRT ENABLE
102 BI -INDEX MK GATED
101 AF -ERROR
102 BH +INDEX MK
A2JC31-03 201 A2PC31A-03 -OFF
8 201 C20C
8 201 C20D
8 141 F20C
108 H8 - WRT THEN RD
A2JE31-44 203 A2PE31C-10 -MANUAL
108 HF -LAST RD/WRT
103 CP +RANDOM
8 140 C03A
1 201 C19A
-(MAN + SEQ •RANDOM) FH 108
+5V 1K
DIR SK, NO R/W (DSO)
108 HG -R/W (DIR• RUN)
107 GE +ON CYL DETECTED
108 HH -(LAST R/W• IM)
8 201 F05D
175H E14A
=1 149H C12B
DSO+(-LAST RD/WRT) FJ 120
=1 149H C12A
DSO + RD/WRT ENABLE FK 120
CONTROL DATA NORMANDALE DIVISION
TB304B/C
HEAD ADRS REG
CODE IDENT 19333
CROSS REF NO 106
C
83319600
SHEET 9
PAGE 5-9
A
CROSS REF NO 106

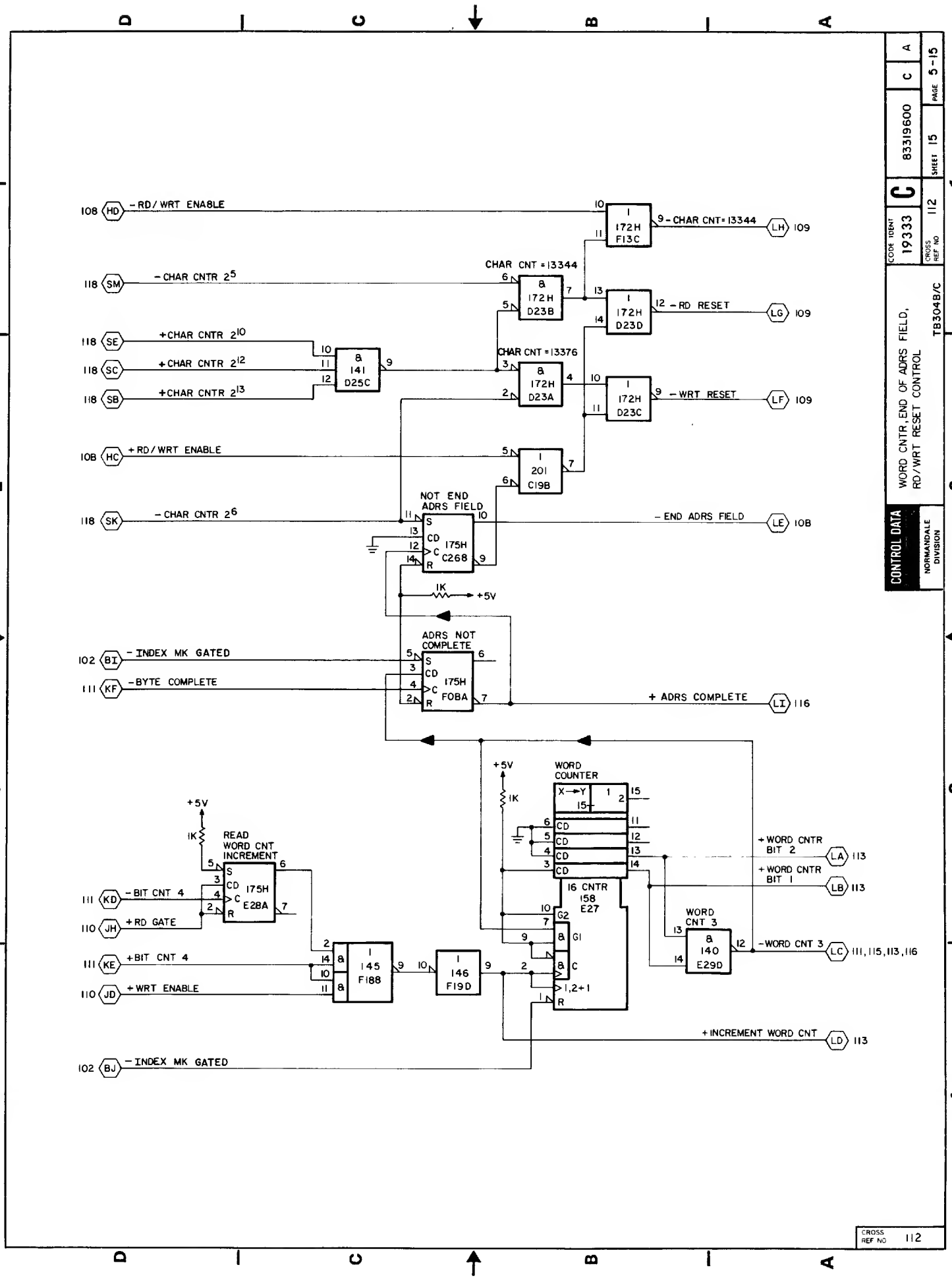

+OFFSET
GA 110
-OFFSET MODE
GB 110
+5V
1K
OFFSET
A2JD31-
09 -OFFSET +
202 PD31B-01
33 -OFFSET -
202 PD31B-13
101 AA +RUN
TEST OFFSET MODE
OFFSET MODE
+OFFSET REV
GC 120
+OFFSET FWD
GD 120
103 CF -T3
NOT OFFSET II
A21
.22UF
22K
+5V
ON CYL LOCKOUT
NOT OFFSET I
103 CA +T7
A2JC31-
13 +MAINT SW
201 A2PC31B-05
140US
+GATED ON CYL
121 UE
+ON CYL DETECTED
GE 102,108
TEST FOR OFFSET
D04
15K
1UF
-ON CYL DETECTED
A2JE31-
01
203 A2PE31A-01
-ON' CYL DETECTED
GF 103
4MS
DELAYED ON CYL
120 TJ -ENABLE HD BUS OUT
-OFFSET CNTL SEL
GG 120
108 HD -RD/WRT ENABLE
101 AD -RUN
CONTROL DATA
NORMANDALE DIVISION
OFFSET CONTROL, ON CYL DETECTION
TB304B/C
CODE IDENT 19333
C
83319600
SHEET 10
PAGE 5-10
CROSS REF NO 107

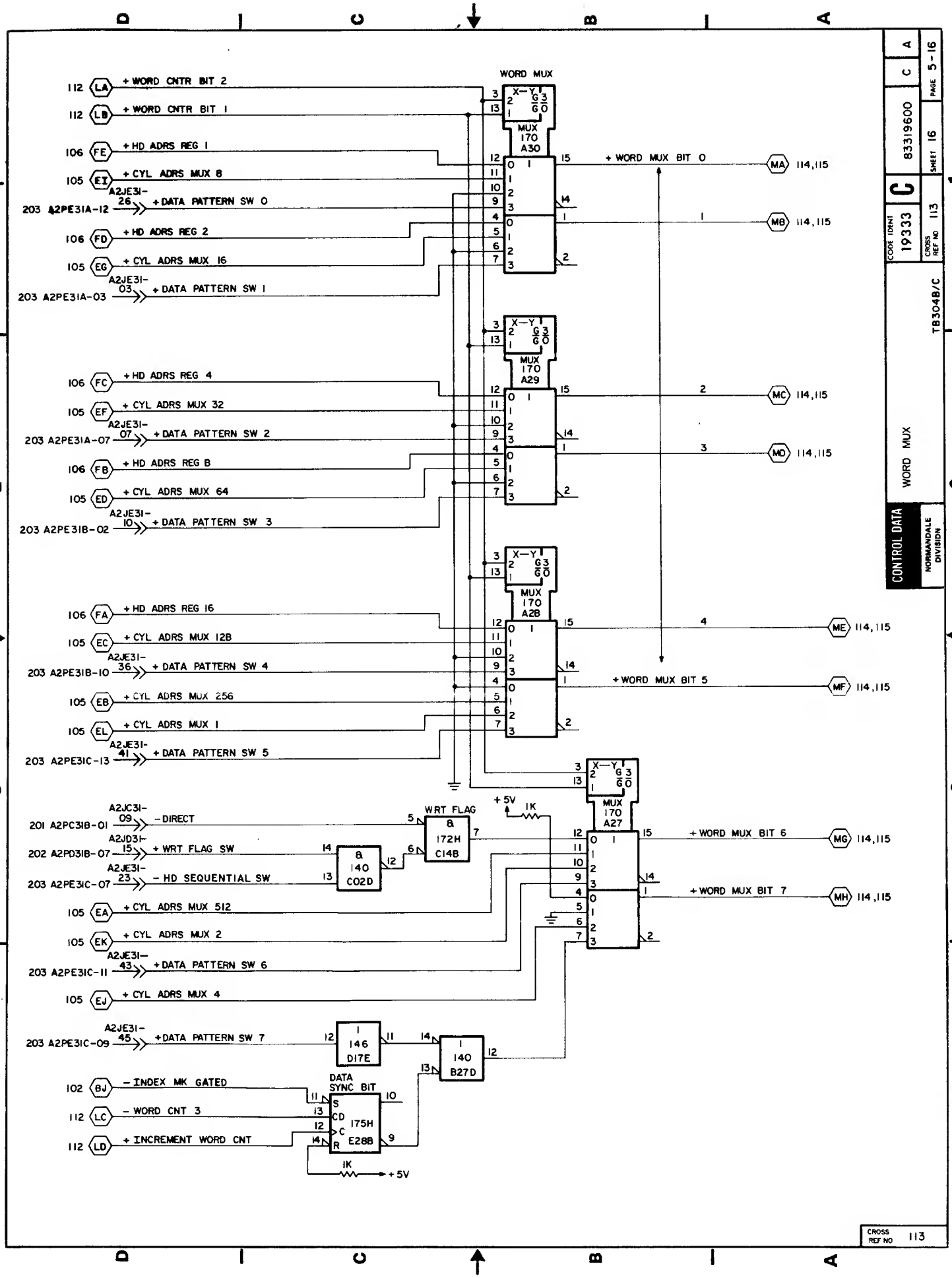

+5V
1K
WRT THEN RD
175H C09A
+ WRT THEN RD
HA 110
102 BI -INDEX MK GATED
110 JE +OFFSET+(WRT • RD)
8 201 F05B
- WRT THEN RD
HB 106,110,120
109 IF +RD SYNC START
109 ID +RD START
104 DL +DIRECT
101 AA +RUN
8 141 D25B
8 173H D24C
8 201 C19D
1 140 C05C
1 146 C06F
8 140 C04B
1 146 C06C
-R/W (DIR • RUN)
HG 106
106 FG -MAX HD
106 FH -(MAN+SEQ • RANDOM)
1 140 D16B
1 145 C16A
101 AE +ERROR
LAST RD/WRT
A2JC31-03
201 A2PC31A-03 -OFF
1 146 D17C
175H C09B
-(LAST R/W • IM)
HH 106
-LAST RD/WRT
HF 106
102 BB +ACCESS ENABLE
1K
+5V
RD/WRT ENABLE
175H C10A
+RD/WRT ENABLE
HC 102,106,109 110,112
-RD/WRT ENABLE
HD 102,107,112
8 140 C02A
1 140 D16C
102 BH +INDEX MK
102 BA +LAST ACCESS
8 143 C13B
C11
107 GE +ON CYL DETECTED
270
.0022UF
11,12
RD ADRS ENABLE
175H E11A
A2JC31-24
201 A2PC31A-14 -WRT FORMAT
112 LE -END ADRS FIELD
-RD ADRS ENABLE
HE 110
CONTROL DATA
NORMANDALE DIVISION
RD/WRT OPERATION START CONTROL
TB304B/C
CODE IDENT 19333
C
83319600
A
C
PAGE 5-11
SHEET 11
CROSS REF NO 108
CROSS REF NO 108

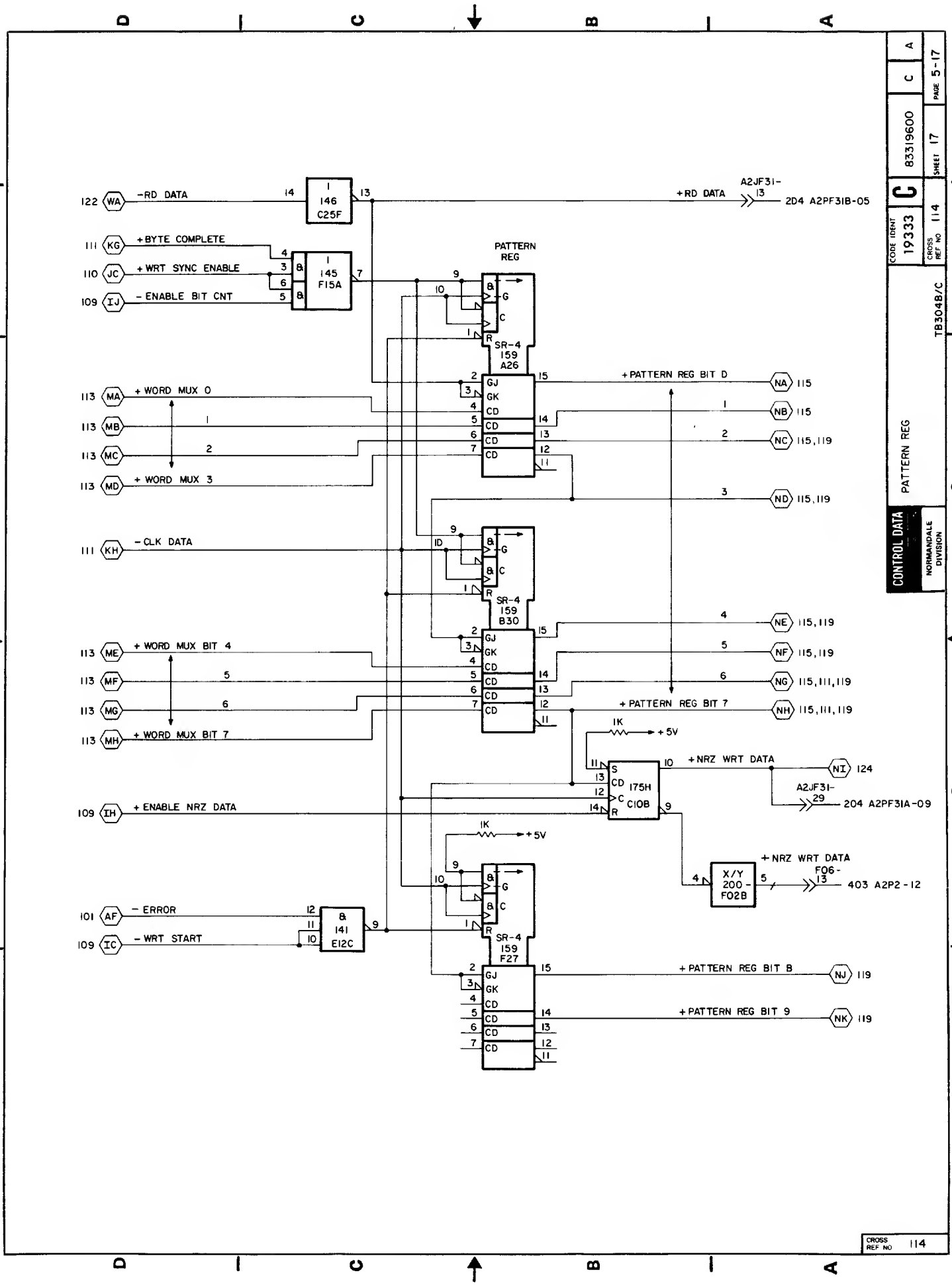

CONTROL DATA NORMANDALE DIVISION
RD / WRT FORMAT CONTROL I
TB304B/C
CODE IDENT 19333
C
83319600
SHEET 12
PAGE 5-12
CROSS REF NO 109
+WRT FORMAT
START WRT FORMAT
-START WRT FORMAT
WRT START
-WRT START
RD START
+RD START
-RD START
RD SYNC START
+RD SYNC START
-RD SYNC START
WRT SYNC START
+ENABLE NRZ DATA
ENABLE BIT CNT
+ENABLE BIT CNT
-ENABLE BIT CNT
SYNC CHECK
-SYNC CHECK
+WRT SYNC/SEARCH FOR SYNC
CHAR CNT = 13,344
+RD/WRT ENABLE
-CHAR CNTR 2^3
-RD RESET
-CHAR CNTR 2^8
+CHAR CNTR 2^13
+CHAR CNTR 2^2
-WRT RESET
+WRT ENABLE
+START SYNC CLK
+WRT SYNC ENABLE
+RD SYNC ENABLE
+WRT SYNC/FOUND SYNC
-CLK DATA
A2JC31-24
201 A2PC31A-14
+5V
1K
C25C
C26A
C21A
C21B
C22A
C22B
C19C
D24B
D24A
D24D
C25B
C24B
C25D
C23A
C23B
CROSS REF NO 109

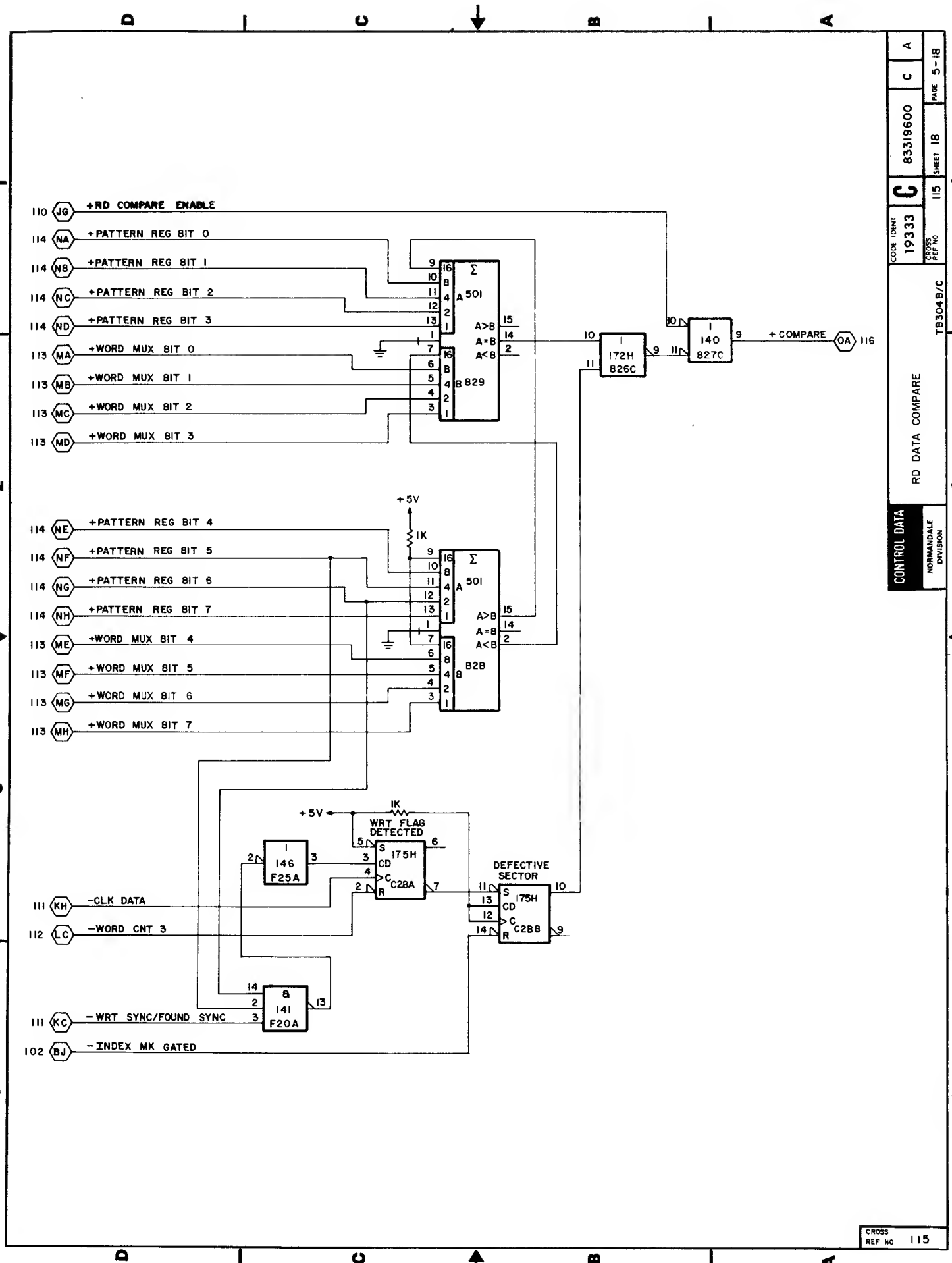

C15
+5V
1K
12
+WRT GATE
A2JF31-
25
204 A2PF31A-13
JA 120
A2JC31-
12
201 A2PC31B-04
+WRT INHIBIT
X/Y 200 - B21B
X/Y 200 - C18E
-WRT GATE
A2JD31-
21
202 A2PD31C-05
JB 120
109 IB -START WRT FORMAT
109 IC -WRT START
8 172H C17A
1 146 D17D
1 173H D15A
1 146 C06A
+WRT ENABLE
JD 109,111,112
+WRT SYNC ENABLE
JC 109,114
108 HE -RD ADRS ENABLE
A2JC31-
25
201 A2PC31A-13
-WRT
24
201 A2PC31A-14
-WRT FORMAT
1 141 E12A
8 201 F10A
8 140 C03D
108 HA +WRT THEN RD
107 GB -OFFSET MODE
108 HC +RD/WRT ENABLE
8 140 C04C
OFFSET + (WRT • RD)
JE 108
A2JC31-
02
201 A2PC31A-02
-(WRT•RD)
1 140 C03B
8 140 C04D
1 141 E12B
8 201 F05A
8 140 E15D
108 HB -WRT THEN RD
A2JC31-
01
201 A2PC31A-01
-RD
+RD SYNC ENABLE
JF 109
8 140 D12C
107 GA +OFFSET
109 IG -RD SYNC START
8 172H C17C
+RD COMPARE ENABLE
JG 111,115,116
+RD GATE
A2JF31-
24
204 A2PF31A-14
JH 112,116,120
109 IE -RD START
8 172H C17B
X/Y 200 - C18D
-RD GATE
A2JD31-
20
202 A2PD31C-04
JJ 111,120
A2JD31-
14
202 A2PD31B-06
-STR EARLY
8 172H C14C
+DATA STRB EARLY
JK 120
202 A2PD31B-03
11
-STR LATE
8 172H C14D
+DATA STRB LATE
JL 120
CONTROL DATA
NORMANDALE DIVISION
RD/WRT FORMAT CONTROL II
TB304 B/C
CODE IDENT 19333
C
83319600
SHEET 13
PAGE 5-13
CROSS REF NO 110
CROSS REF NO 110

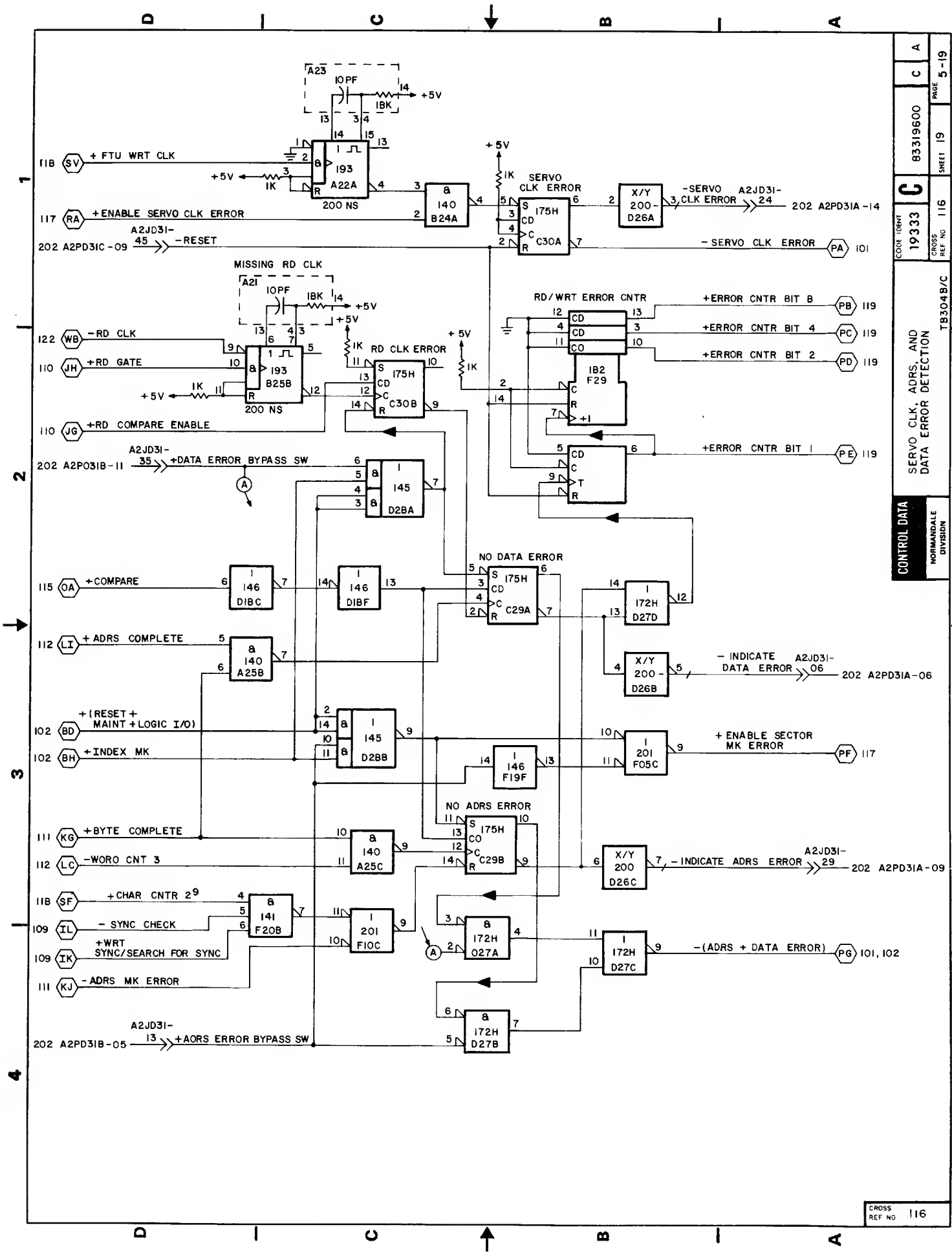

BIT CNTR
16 CNTR 15B E26
WRT SYNC / FOUND SYNC
AM SEARCH
WRITE AM
START AM
+ BIT CNT 4
- BIT CNT 4
- BYTE COMPLETE
+BYTE COMPLETE
+ WRT SYNC / FOUND SYNC
- WRT SYNC / FOUND SYNC
- CLK DATA
+ START SYNC CLK
+ RD CLK •(- RD ERROR)
- ADRS MK ERROR
+ ADRS MK ENABLE
+ENABLE BIT CNT
+ INDEX MK
+ WRT SYNC / SEARCH FOR SYNC
+ PATTERN REG BIT 7
+ PATTERN REG BIT 6
+ WRT ENABLE
- FTU WRT CLK
- RD CLK
- ERROR
+ RD COMPARE ENABLE
+ WRT FORMAT
- RD GATE
+ AM FOUND
+ RESET
- WRT FORMAT SW
+ ADRS MK SW
-CHAR CNTR 2²
+ RD START
- WORD CNT 3
+CHAR CNTR 2⁰
- INDEX MK GATED
CONTROL DATA
NORMANDALE DIVISION
BIT CNTR, WRT SYNC / FOUND SYNC AND ADRS MK LOGIC
TB3048/C
CODE IDENT 19333
CROSS REF NO
C
83319600
SHEET 14
PAGE 5-14
CROSS REF NO 111

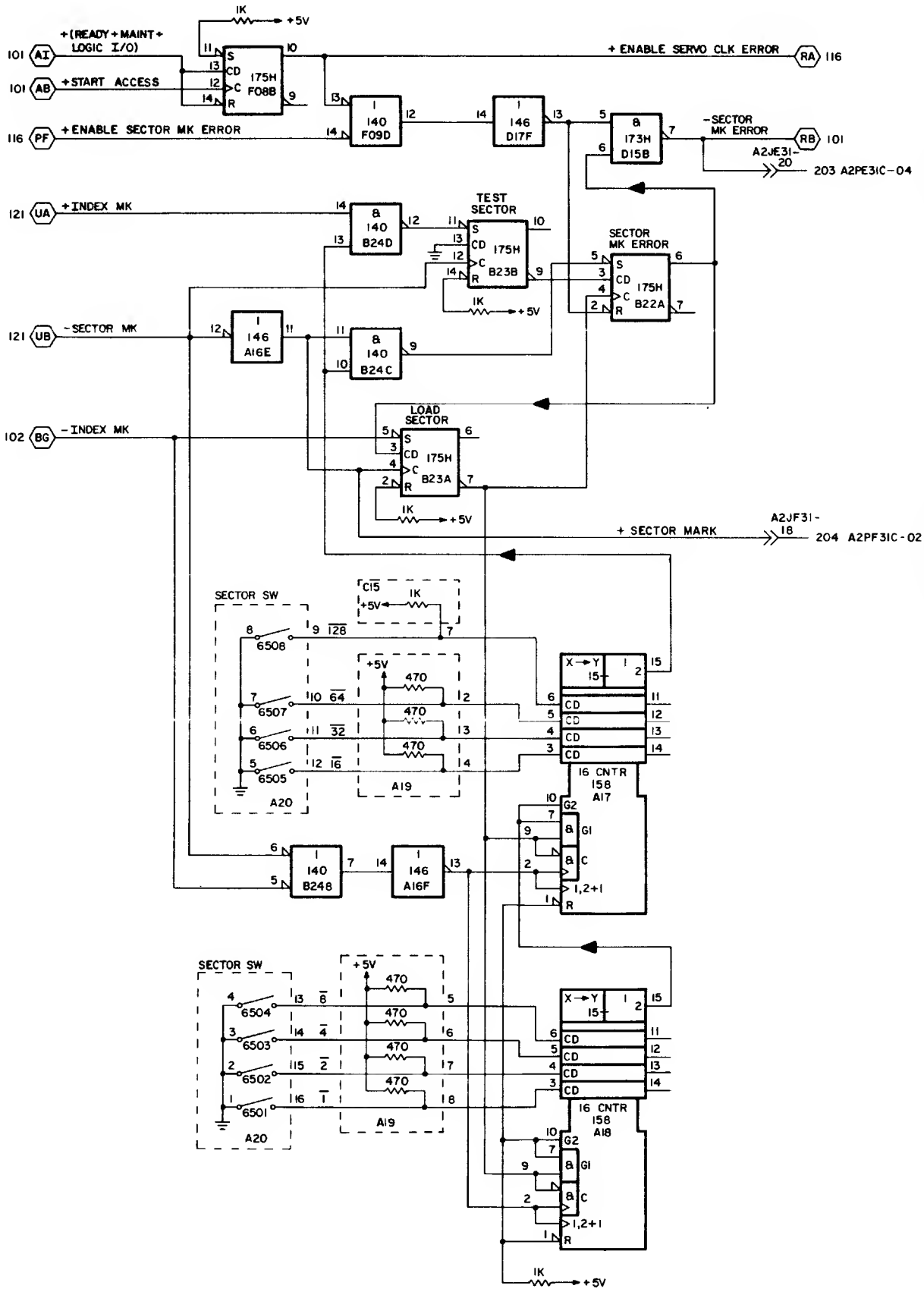

108 HD - RD/WRT ENABLE
118 SM - CHAR CNTR 2^5
118 SE +CHAR CNTR 2^10
118 SC +CHAR CNTR 2^12
118 SB +CHAR CNTR 2^13
108 HC +RD/WRT ENABLE
118 SK - CHAR CNTR 2^6
102 BI - INDEX MK GATED
111 KF - BYTE COMPLETE
111 KD - BIT CNT 4
110 JH +RD GATE
111 KE +BIT CNT 4
110 JD +WRT ENABLE
102 BJ - INDEX MK GATED
1 172H F13C
9 - CHAR CNT = 13344 LH 109
CHAR CNT = 13344
8 172H D23B
1 172H D23D
12 - RD RESET LG 109
CHAR CNT = 13376
8 141 D25C
8 172H D23A
1 172H D23C
9 - WRT RESET LF 109
1 201 C19B
NOT END ADRS FIELD
175H C268
- END ADRS FIELD LE 108
1K +5V
ADRS NOT COMPLETE
175H F08A
+ ADRS COMPLETE LI 116
READ WORD CNT INCREMENT
175H E28A
1 145 F18B
1 146 F19D
+5V
1K
WORD COUNTER
X→Y
16 CNTR 158 E27
+WORD CNTR BIT 2 LA 113
+WORD CNTR BIT 1 LB 113
WORD CNT 3
8 140 E29D
-WORD CNT 3 LC 111,115,113,116
1,2+1
+INCREMENT WORD CNT LD 113
CONTROL DATA
NORMANDALE DIVISION
WORD CNTR, END OF ADRS FIELD, RD/WRT RESET CONTROL
TB3048B/C
CODE IDENT 19333
C
83319600
A
SHEET 15
PAGE 5-15
CROSS REF NO 112
CROSS REF NO 112

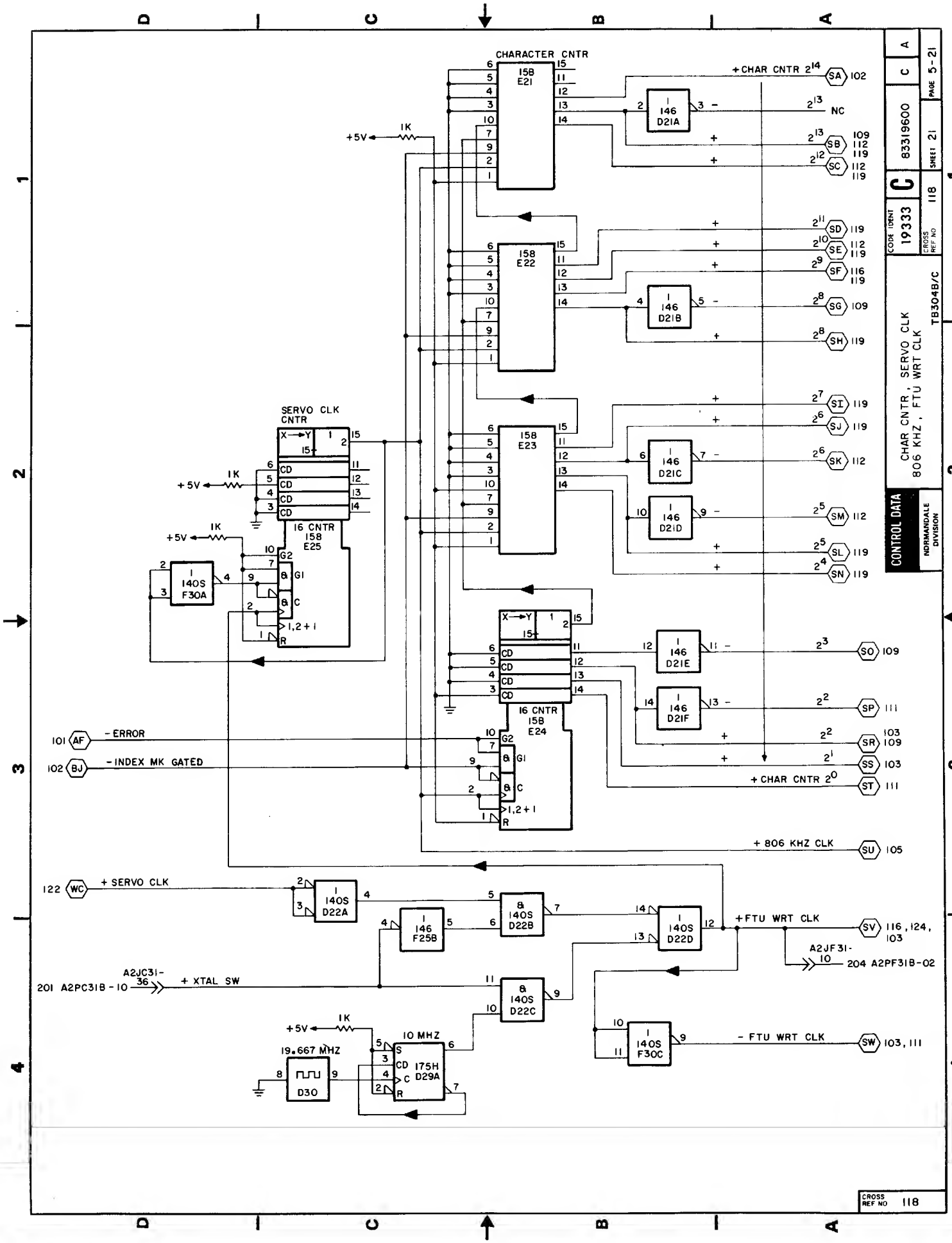

WORD MUX
112 LA + WORD CNTR BIT 2
112 LB + WORD CNTR BIT 1
106 FE + HD ADRS REG 1
105 EI + CYL ADRS MUX 8
A2JE31-26
203 A2PE31A-12 + DATA PATTERN SW 0
106 FD + HD ADRS REG 2
105 EG + CYL ADRS MUX 16
A2JE31-03
203 A2PE31A-03 + DATA PATTERN SW 1
MUX 170 A30
+ WORD MUX BIT 0
MA 114,115
MB 114,115
106 FC + HD ADRS REG 4
105 EF + CYL ADRS MUX 32
A2JE31-07
203 A2PE31A-07 + DATA PATTERN SW 2
106 FB + HD ADRS REG 8
105 ED + CYL ADRS MUX 64
A2JE31-10
203 A2PE31B-02 + DATA PATTERN SW 3
MUX 170 A29
MC 114,115
MD 114,115
106 FA + HD ADRS REG 16
105 EC + CYL ADRS MUX 128
A2JE31-36
203 A2PE31B-10 + DATA PATTERN SW 4
105 EB + CYL ADRS MUX 256
105 EL + CYL ADRS MUX 1
A2JE31-41
203 A2PE31C-13 + DATA PATTERN SW 5
MUX 170 A28
+ WORD MUX BIT 5
ME 114,115
MF 114,115
A2JC31-09
201 A2PC31B-01 - DIRECT
A2JD31-15
202 A2PD31B-07 + WRT FLAG SW
A2JE31-23
203 A2PE31C-07 - HD SEQUENTIAL SW
WRT FLAG
8 172H C14B
8 140 C02D
+5V
1K
MUX 170 A27
+ WORD MUX BIT 6
+ WORD MUX BIT 7
MG 114,115
MH 114,115
105 EA + CYL ADRS MUX 512
105 EK + CYL ADRS MUX 2
A2JE31-43
203 A2PE31C-11 + DATA PATTERN SW 6
105 EJ + CYL ADRS MUX 4
A2JE31-45
203 A2PE31C-09 + DATA PATTERN SW 7
1 146 D17E
1 140 B27D
102 BJ - INDEX MK GATED
112 LC - WORD CNT 3
112 LD + INCREMENT WORD CNT
DATA SYNC BIT
175H E28B
1K
+5V
CONTROL DATA
NORMANDALE DIVISION
WORD MUX
TB3048/C
CODE IDENT 19333
C
83319600
SHEET 16
PAGE 5-16
CROSS REF NO 113
CROSS REF NO 113

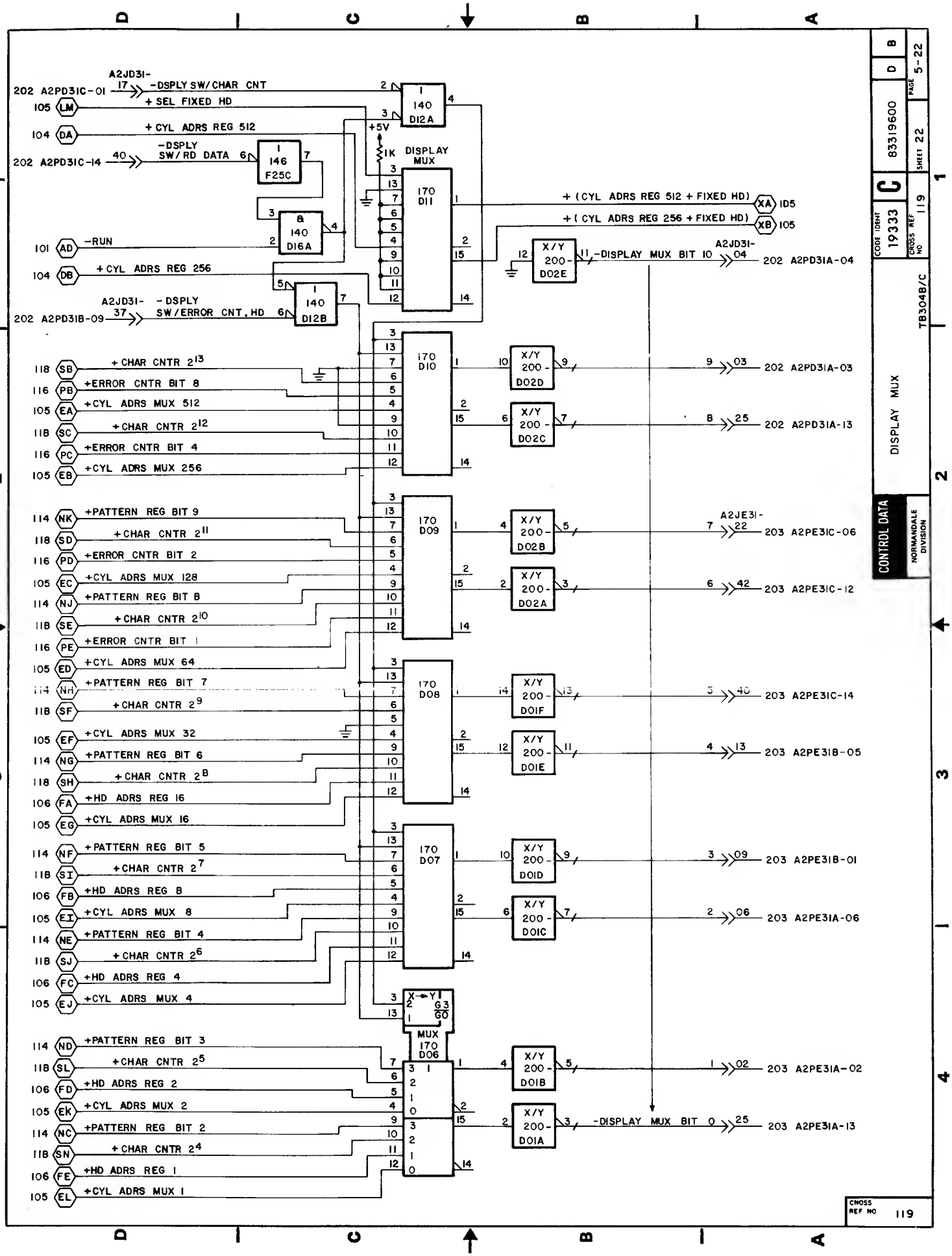

122 WA -RD DATA
1 146 C25F
+RD DATA
A2JF31- 13
2D4 A2PF31B-05
111 KG +BYTE COMPLETE
110 JC +WRT SYNC ENABLE
109 IJ - ENABLE BIT CNT
1 145 F15A
PATTERN REG
SR-4 159 A26
+PATTERN REG BIT D
NA 115
NB 115
NC 115,119
ND 115,119
113 MA +WORD MUX 0
113 MB 1
113 MC 2
113 MD +WORD MUX 3
111 KH -CLK DATA
SR-4 159 B30
NE 115,119
NF 115,119
NG 115,111,119
NH 115,111,119
113 ME +WORD MUX BIT 4
113 MF 5
113 MG 6
113 MH +WORD MUX BIT 7
+PATTERN REG BIT 7
1K
+5V
S CD C R 175H C10B
+NRZ WRT DATA
NI 124
A2JF31- 29
204 A2PF31A-09
109 IH +ENABLE NRZ DATA
X/Y 200-F02B
F06- 13
403 A2P2-12
101 AF - ERROR
109 IC - WRT START
8 141 E12C
SR-4 159 F27
+PATTERN REG BIT B
NJ 119
+PATTERN REG BIT 9
NK 119
CONTROL DATA
NORMANDALE DIVISION
PATTERN REG
TB3048/C
CODE IDENT 19333
C
83319600
SHEET 17
PAGE 5-17
CROSS REF NO 114
CROSS REF NO 114

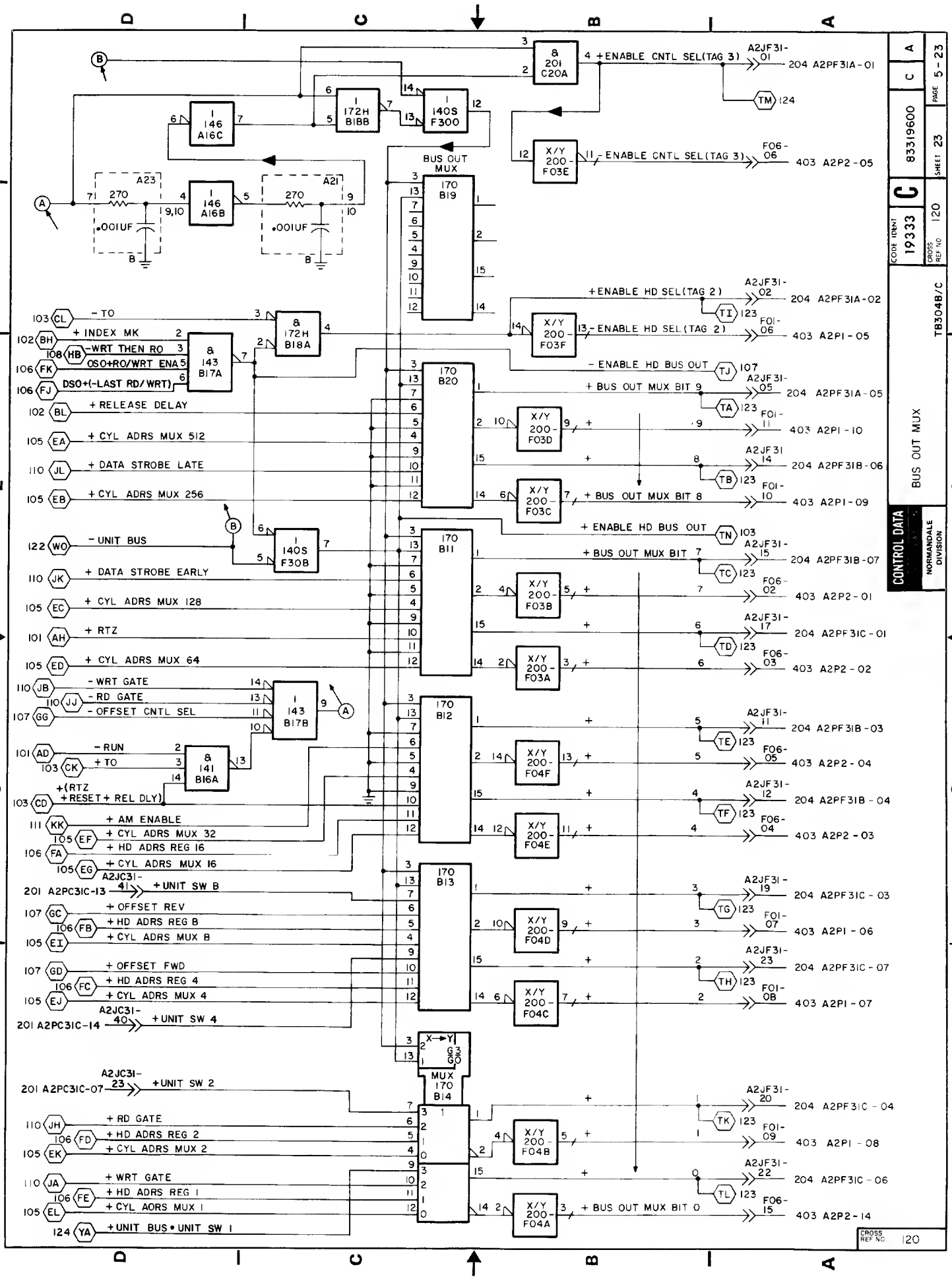

110 JG +RD COMPARE ENABLE
114 NA +PATTERN REG BIT 0
114 NB +PATTERN REG BIT 1
114 NC +PATTERN REG BIT 2
114 ND +PATTERN REG BIT 3
113 MA +WORD MUX BIT 0
113 MB +WORD MUX BIT 1
113 MC +WORD MUX BIT 2
113 MD +WORD MUX BIT 3
Σ A 501
B 829
A>B
A=B
A<B
1 172H 826C
1 140 827C
+ COMPARE OA 116
+5V
1K
114 NE +PATTERN REG BIT 4
114 NF +PATTERN REG BIT 5
114 NG +PATTERN REG BIT 6
114 NH +PATTERN REG BIT 7
113 ME +WORD MUX BIT 4
113 MF +WORD MUX BIT 5
113 MG +WORD MUX BIT 6
113 MH +WORD MUX BIT 7
Σ A 501
B 82B
WRT FLAG DETECTED
1 146 F25A
S CD C R 175H C28A
DEFECTIVE SECTOR
S CD C R 175H C2B8
111 KH -CLK DATA
112 LC -WORD CNT 3
8 141 F20A
111 KC -WRT SYNC/FOUND SYNC
102 BJ -INDEX MK GATED
CONTROL DATA
NORMANDALE DIVISION
RD DATA COMPARE
TB304 B/C
CODE IDENT 19333
CROSS REF NO 115
C
83319600
SHEET 18
PAGE 5-18
A
C
CROSS REF NO 115

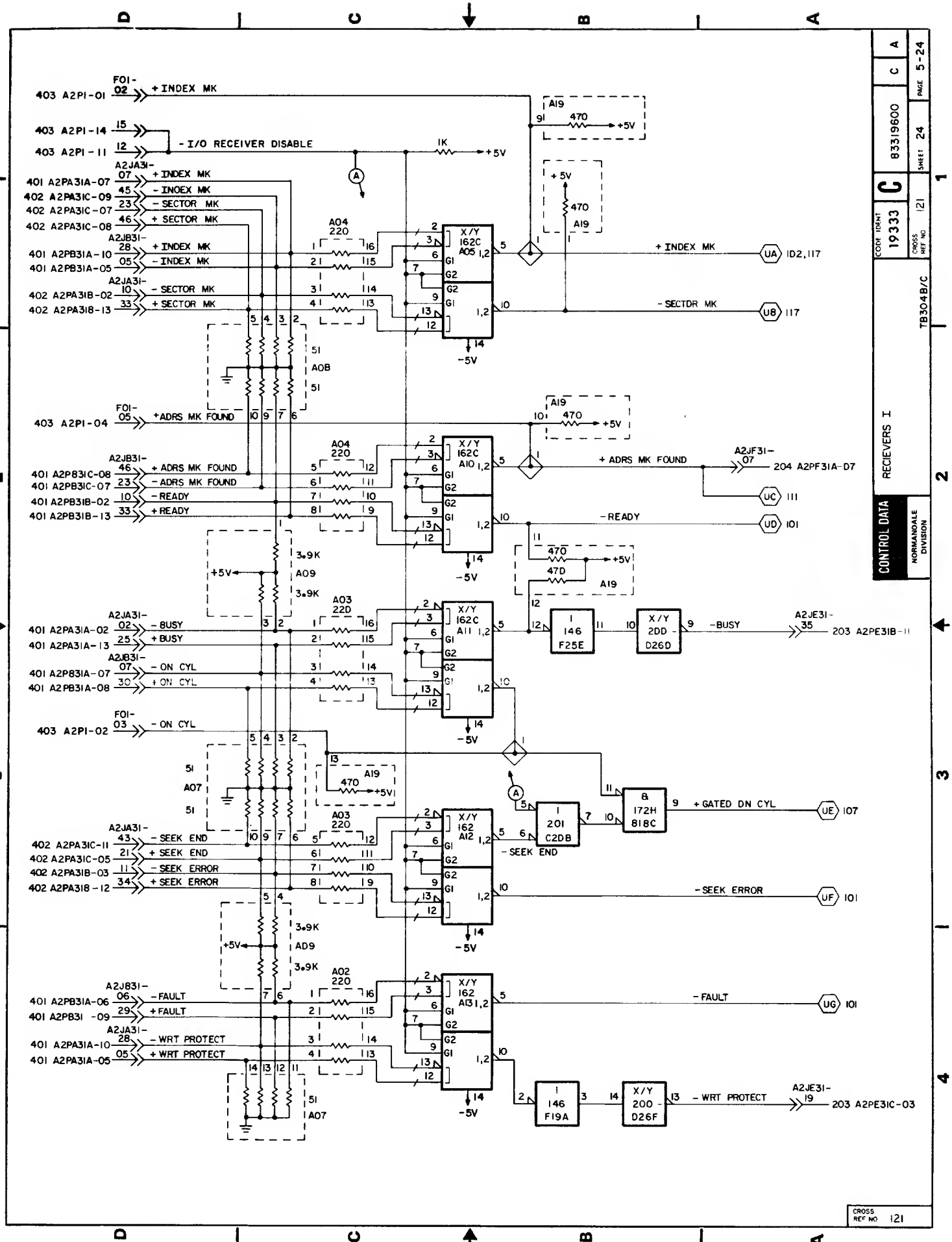

A23
10PF
+5V
1BK
+FTU WRT CLK
+ENABLE SERVO CLK ERROR
-RESET
200 NS
SERVO CLK ERROR
-SERVO CLK ERROR
A2JD31-24
202 A2PD31A-14
-SERVO CLK ERROR
MISSING RD CLK
A21
-RD CLK
+RD GATE
+RD COMPARE ENABLE
RD CLK ERROR
RD/WRT ERROR CNTR
+ERROR CNTR BIT B
+ERROR CNTR BIT 4
+ERROR CNTR BIT 2
+ERROR CNTR BIT 1
A2JD31-35
202 A2P031B-11
+DATA ERROR BYPASS SW
NO DATA ERROR
+COMPARE
+ADRS COMPLETE
- INDICATE DATA ERROR
A2JD31-06
202 A2PD31A-06
+(RESET + MAINT + LOGIC I/O)
+INDEX MK
+ENABLE SECTOR MK ERROR
NO ADRS ERROR
+BYTE COMPLETE
-WORD CNT 3
+CHAR CNTR 2^9
- SYNC CHECK
+WRT SYNC/SEARCH FOR SYNC
- ADRS MK ERROR
- INDICATE ADRS ERROR
A2JD31-29
202 A2PD31A-09
-(ADRS + DATA ERROR)
A2JD31-13
202 A2PD31B-05
+ADRS ERROR BYPASS SW
CONTROL DATA
NORMANDALE DIVISION
SERVO CLK, ADRS, AND DATA ERROR DETECTION
TB304B/C
CODE IDENT 19333
CROSS REF NO 116
SHEET 19
PAGE 5-19
CROSS REF NO 116

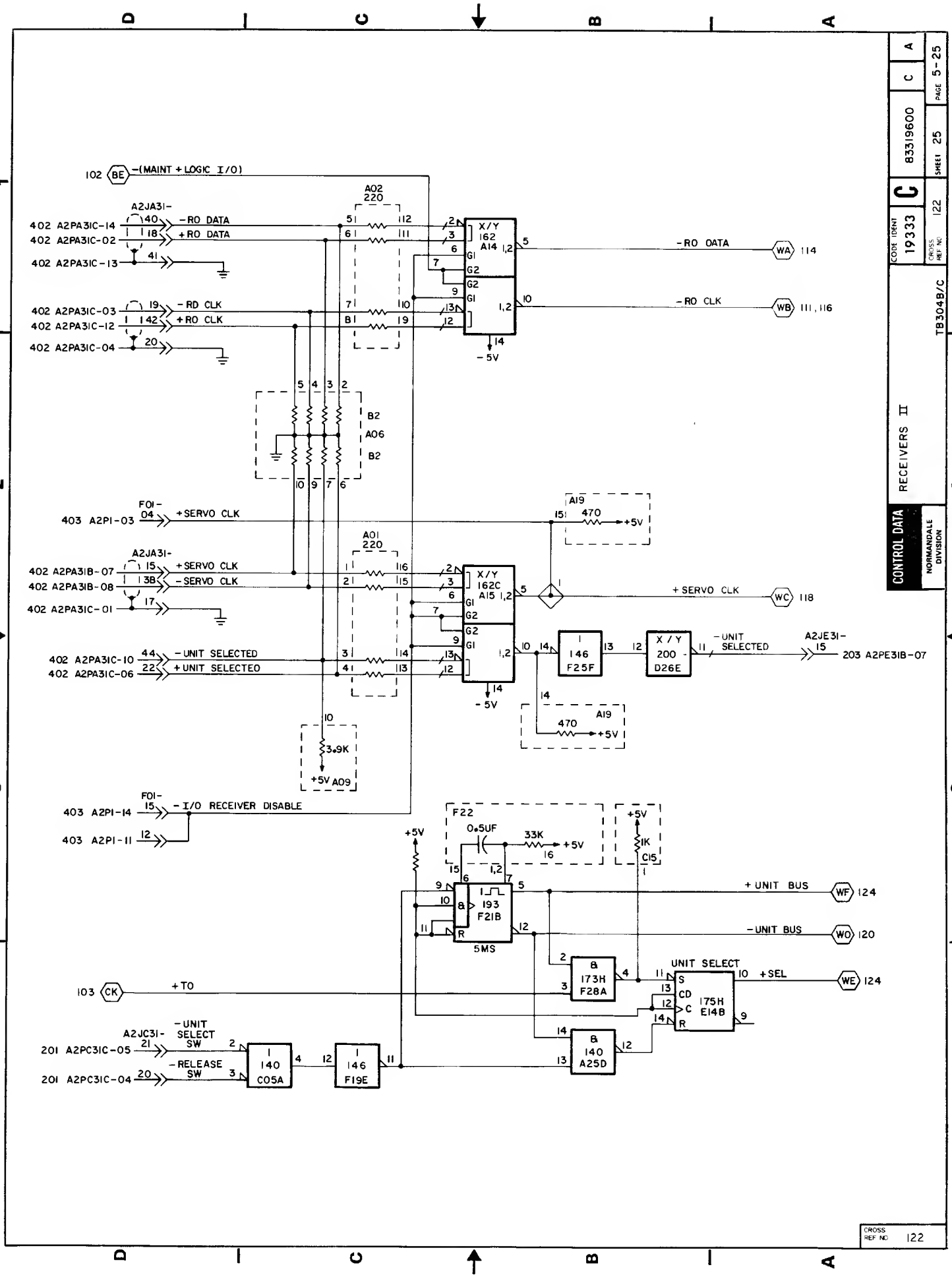

+(READY+MAINT+ LOGIC I/O)
101 AI
+START ACCESS
101 AB
116 PF
+ENABLE SECTOR MK ERROR
1K
+5V
175H F08B
+ ENABLE SERVO CLK ERROR
RA 116
140 F09D
146 D17F
173H D15B
-SECTOR MK ERROR
RB 101
A2JE31-20
203 A2PE31C-04
121 UA
+INDEX MK
140 B24D
TEST SECTOR
175H B23B
SECTOR MK ERROR
175H B22A
121 UB
-SECTOR MK
146 A16E
140 B24C
102 BG
-INDEX MK
LOAD SECTOR
175H B23A
+ SECTOR MARK
A2JF31-18
204 A2PF31C-02
SECTOR SW
C15
6508
6507
6506
6505
A20
A19
470
X→Y
CD
16 CNTR 158 A17
G2
G1
C
1,2+1
R
140 B24B
146 A16F
SECTOR SW
6504
6503
6502
6501
16 CNTR 158 A18
CONTROL DATA
NORMANDALE DIVISION
SECTOR COUNTING AND ERROR DETECTION
TB304B/C
CODE IDENT 19333
C
CROSS REF NO 117
SHEET 20
PAGE 5-20
A
CROSS REF NO 117


CHARACTER CNTR
158 E21
158 E22
158 E23
158 E24
+5V
1K
+CHAR CNTR 2^14
SA 102
2^13 NC
2^13 SB 109 112 119
2^12 SC 112 119
2^11 SD 119
2^10 SE 112 119
2^9 SF 116 119
2^8 SG 109
2^8 SH 119
2^7 SI 119
2^6 SJ 119
2^6 SK 112
2^5 SM 112
2^5 SL 119
2^4 SN 119
2^3 SO 109
2^2 SP 111
2^2 SR 103 109
2^1 SS 103
+CHAR CNTR 2^0 ST 111
146 D21A
146 D21B
146 D21C
146 D21D
146 D21E
146 D21F
SERVO CLK CNTR
16 CNTR 158 E25
16 CNTR 158 E24
140S F30A
101 AF - ERROR
102 BJ - INDEX MK GATED
+ 806 KHZ CLK SU 105
122 WC + SERVO CLK
140S D22A
146 F25B
140S D22B
140S D22D
+FTU WRT CLK SV 116, 124, 103
A2JF31-10 204 A2PF318-02
A2JC31-36 201 A2PC318-10 + XTAL SW
140S D22C
140S F30C
- FTU WRT CLK SW 103, 111
10 MHZ
19.667 MHZ
D30
175H D29A
CHAR CNTR, SERVO CLK
806 KHZ, FTU WRT CLK
TB304B/C
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C 83319600
SHEET 21
PAGE 5-21
CROSS REF NO 118


A2JD31-17 -DSPLY SW/CHAR CNT
202 A2PD31C-01
105 LM + SEL FIXED HD
104 DA + CYL ADRS REG 512
202 A2PD31C-14 40 -DSPLY SW/RD DATA 6
1 146 F25C 7
+5V
1K
DISPLAY MUX
1 140 D12A 4
8 140 D16A 4
1 140 D12B 7
101 AD -RUN
104 DB + CYL ADRS REG 256
A2JD31-37 -DSPLY SW/ERROR CNT, HD
202 A2PD31B-09 6
170 D11
+ (CYL ADRS REG 512 + FIXED HD) XA ID5
+ (CYL ADRS REG 256 + FIXED HD) XB 105
X/Y 200-D02E
-DISPLAY MUX BIT 10
A2JD31-04
202 A2PD31A-04
170 D10
118 SB + CHAR CNTR 2^13
116 PB +ERROR CNTR BIT 8
105 EA +CYL ADRS MUX 512
118 SC + CHAR CNTR 2^12
116 PC +ERROR CNTR BIT 4
105 EB +CYL ADRS MUX 256
X/Y 200-D02D
X/Y 200-D02C
9 03 202 A2PD31A-03
8 25 202 A2PD31A-13
170 D09
114 NK +PATTERN REG BIT 9
118 SD + CHAR CNTR 2^11
116 PD +ERROR CNTR BIT 2
105 EC +CYL ADRS MUX 128
114 NJ +PATTERN REG BIT 8
118 SE + CHAR CNTR 2^10
116 PE +ERROR CNTR BIT 1
105 ED +CYL ADRS MUX 64
X/Y 200-D02B
X/Y 200-D02A
A2JE31-22 203 A2PE31C-06
6 42 203 A2PE31C-12
170 D08
114 NH +PATTERN REG BIT 7
118 SF + CHAR CNTR 2^9
105 EF +CYL ADRS MUX 32
114 NG +PATTERN REG BIT 6
118 SH + CHAR CNTR 2^8
106 FA +HD ADRS REG 16
105 EG +CYL ADRS MUX 16
X/Y 200-D01F
X/Y 200-D01E
5 40 203 A2PE31C-14
4 13 203 A2PE31B-05
170 D07
114 NF +PATTERN REG BIT 5
118 SI + CHAR CNTR 2^7
106 FB +HD ADRS REG 8
105 EI +CYL ADRS MUX 8
114 NE +PATTERN REG BIT 4
118 SJ + CHAR CNTR 2^6
106 FC +HD ADRS REG 4
105 EJ +CYL ADRS MUX 4
X/Y 200-D01D
X/Y 200-D01C
3 09 203 A2PE31B-01
2 06 203 A2PE31A-06
X→Y G3 G0
MUX 170 D06
114 ND +PATTERN REG BIT 3
118 SL + CHAR CNTR 2^5
106 FD +HD ADRS REG 2
105 EK +CYL ADRS MUX 2
114 NC +PATTERN REG BIT 2
118 SN + CHAR CNTR 2^4
106 FE +HD ADRS REG 1
105 EL +CYL ADRS MUX 1
X/Y 200-D01B
X/Y 200-D01A
1 02 203 A2PE31A-02
-DISPLAY MUX BIT 0 25 203 A2PE31A-13
CONTROL DATA NORMANDALE DIVISION
DISPLAY MUX TB3048/C
CODE IDENT 19333 C 83319600 D B
PAGE 5-22 SHEET 22 CROSS REF NO 119
CROSS REF NO 119


BUS OUT MUX
CONTROL DATA
NORMANDALE DIVISION
TB3048B/C
BUS OUT MUX
CODE IDENT 19333
C
CROSS REF NO 120
83319600
SHEET 23
PAGE 5 - 23
A
C
8 201 C20A
+ENABLE CNTL SEL(TAG 3)
A2JF31-01
204 A2PF31A-01
TM 124
1 172H B18B
1 140S F300
1 146 A16C
1 146 A16B
A23
A21
270
.001UF
X/Y 200-F03E
+ENABLE CNTL SEL(TAG 3)
FO6-06
403 A2P2-05
170 B19
+ENABLE HD SEL(TAG 2)
A2JF31-02
204 A2PF31A-02
TI 123
X/Y 200-F03F
FO1-06
403 A2P1-05
103 CL - TO
102 BH + INDEX MK
108 HB -WRT THEN RQ
106 FK OSO+RO/WRT ENA
106 FJ DSO+(-LAST RD/WRT)
8 143 B17A
8 172H B18A
102 BL + RELEASE DELAY
105 EA + CYL ADRS MUX 512
110 JL + DATA STROBE LATE
105 EB + CYL ADRS MUX 256
- ENABLE HD BUS OUT
TJ 107
170 B20
+ BUS OUT MUX BIT 9
A2JF31-05
204 A2PF31A-05
TA 123
X/Y 200-F03D
FO1-11
403 A2P1-10
A2JF31-14
204 A2PF31B-06
TB 123
X/Y 200-F03C
+ BUS OUT MUX BIT 8
FO1-10
403 A2P1-09
122 WO - UNIT BUS
1 140S F30B
110 JK + DATA STROBE EARLY
105 EC + CYL ADRS MUX 128
101 AH + RTZ
105 ED + CYL ADRS MUX 64
+ ENABLE HD BUS OUT
TN 103
170 B11
+ BUS OUT MUX BIT 7
A2JF31-15
204 A2PF31B-07
TC 123
X/Y 200-F03B
FO6-02
403 A2P2-01
A2JF31-17
204 A2PF31C-01
TD 123
X/Y 200-F03A
FO6-03
403 A2P2-02
110 JB - WRT GATE
110 JJ - RD GATE
107 GG - OFFSET CNTL SEL
1 143 B17B
101 AD - RUN
103 CK + TO
8 141 B16A
103 CD +(RTZ +RESET+ REL DLY)
111 KK + AM ENABLE
105 EF + CYL ADRS MUX 32
106 FA + HD ADRS REG 16
105 EG + CYL ADRS MUX 16
170 B12
A2JF31-11
204 A2PF31B-03
TE 123
X/Y 200-F04F
FO6-05
403 A2P2-04
A2JF31-12
204 A2PF31B-04
TF 123
X/Y 200-F04E
FO6-04
403 A2P2-03
A2JC31-41
201 A2PC31C-13
+UNIT SW B
107 GC + OFFSET REV
106 FB + HD ADRS REG B
105 EI + CYL ADRS MUX B
107 GD + OFFSET FWD
106 FC + HD ADRS REG 4
105 EJ + CYL ADRS MUX 4
A2JC31-40
201 A2PC31C-14
+UNIT SW 4
170 B13
A2JF31-19
204 A2PF31C-03
TG 123
X/Y 200-F04D
FO1-07
403 A2P1-06
A2JF31-23
204 A2PF31C-07
TH 123
X/Y 200-F04C
FO1-08
403 A2P1-07
X→Y G3 G0
MUX 170 B14
A2JC31-23
201 A2PC31C-07
+UNIT SW 2
110 JH + RD GATE
106 FD + HD ADRS REG 2
105 EK + CYL ADRS MUX 2
110 JA + WRT GATE
106 FE + HD ADRS REG 1
105 EL + CYL ADRS MUX 1
124 YA +UNIT BUS • UNIT SW 1
A2JF31-20
204 A2PF31C-04
TK 123
X/Y 200-F04B
FO1-09
403 A2P1-08
A2JF31-22
204 A2PF31C-06
TL 123
X/Y 200-F04A
+ BUS OUT MUX BIT 0
FO6-15
403 A2P2-14
CROSS REF NO 120


RECIEVERS I
TB304B/C
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
CROSS REF NO 121
8331960O
SHEET 24
PAGE 5-24
A
C
403 A2P1-01 FOI-02 +INDEX MK
403 A2P1-14 15
403 A2P1-11 12 -I/O RECEIVER DISABLE
1K +5V
A19 470 +5V
401 A2PA31A-07 A2JA31-07 +INDEX MK
402 A2PA31C-09 45 -INDEX MK
402 A2PA31C-07 23 -SECTOR MK
402 A2PA31C-08 46 +SECTOR MK
401 A2PB31A-10 A2JB31-28 +INDEX MK
401 A2PB31A-05 05 -INDEX MK
402 A2PA31B-02 A2JA31-10 -SECTOR MK
402 A2PA31B-13 33 +SECTOR MK
A04 220
A08 5I
X/Y 162C A05 1,2
+INDEX MK UA ID2,117
-SECTOR MK U8 117
-5V
403 A2P1-04 FOI-05 +ADRS MK FOUND
401 A2PB31C-08 A2JB31-46 +ADRS MK FOUND
401 A2PB31C-07 23 -ADRS MK FOUND
401 A2PB31B-02 10 -READY
401 A2PB31B-13 33 +READY
A04 220
A09 3.9K
X/Y 162C A10 1,2
+ADRS MK FOUND A2JF31-07 204 A2PF31A-D7
UC 111
-READY UD 101
-5V
401 A2PA31A-02 A2JA31-02 -BUSY
401 A2PA31A-13 25 +BUSY
401 A2PB31A-07 A2JB31-07 -ON CYL
401 A2PB31A-08 30 +ON CYL
403 A2P1-02 FOI-03 -ON CYL
A03 220D
A07 5I
X/Y 162C A11 1,2
1 146 F25E
X/Y 2DD - D26D
-BUSY A2JE31-35 203 A2PE31B-11
-5V
402 A2PA31C-11 A2JA31-43 -SEEK END
402 A2PA31C-05 21 +SEEK END
402 A2PA31B-03 11 -SEEK ERROR
402 A2PA31B-12 34 +SEEK ERROR
A03 220
AD9 3.9K
X/Y 162 A12 1,2
1 201 C2DB
8 172H 818C
+GATED DN CYL UE 107
-SEEK END
-SEEK ERROR UF 101
-5V
401 A2PB31A-06 A2JB31-06 -FAULT
401 A2PB31 -09 29 +FAULT
401 A2PA31A-10 A2JA31-28 -WRT PROTECT
401 A2PA31A-05 05 +WRT PROTECT
A02 220
A07 5I
X/Y 162 A13 1,2
-FAULT UG 101
1 146 F19A
X/Y 200 - D26F
-WRT PROTECT A2JE31-19 203 A2PE31C-03
-5V
CROSS REF NO 121



CONTROL DATA NORMANDALE DIVISION

RECEIVERS II

TB304B/C

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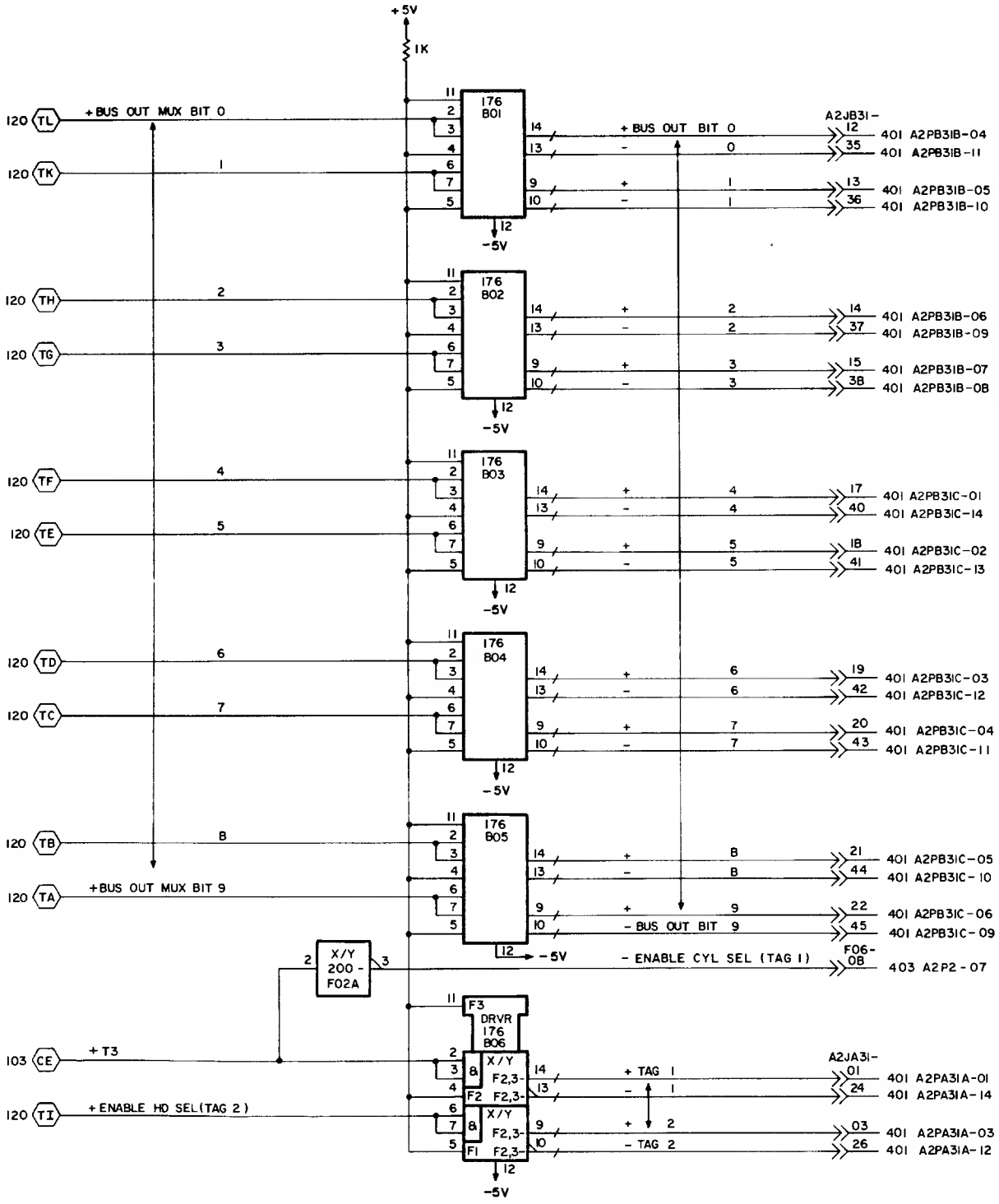
CROSS REF NO 122



CONTROL DATA
NORMANDALE DIVISION

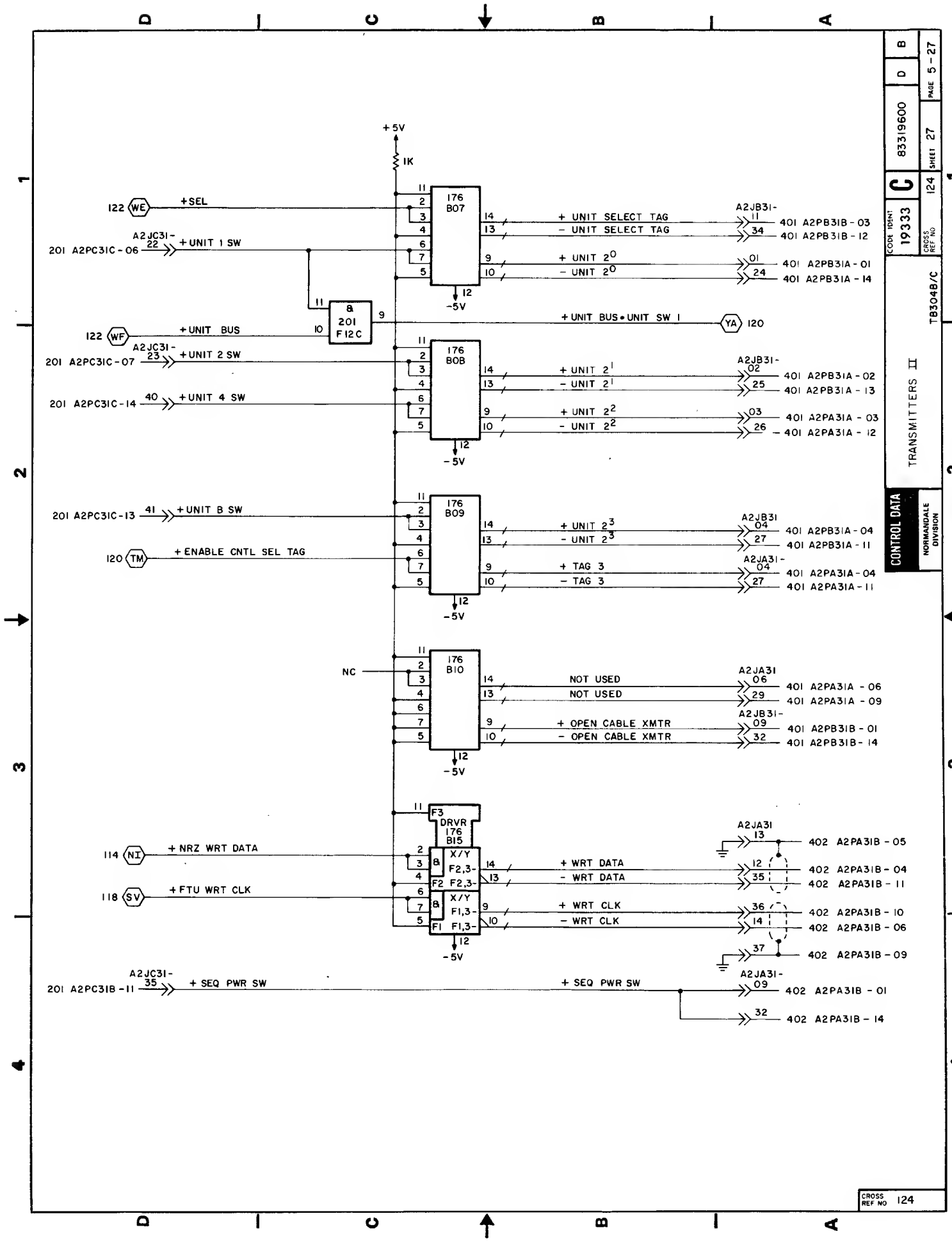
TRANSMITTERS I

TB3048B/C

CODE IDENT 19333 | C | 83319600 | C | A

CROSS REF NO 123 | SHEET 26 | PAGE 5-26

CROSS REF NO 123


+5V
1K
176 B07
122 WE +SEL
A2JC31-22 +UNIT 1 SW
201 A2PC31C-06
+ UNIT SELECT TAG
- UNIT SELECT TAG
+ UNIT 2^0
- UNIT 2^0
A2JB31-11
401 A2PB31B-03
A2JB31-34
401 A2PB31B-12
A2JB31-01
401 A2PB31A-01
A2JB31-24
401 A2PB31A-14
-5V
8 201 F12C
122 WF +UNIT BUS
+UNIT BUS • UNIT SW 1
YA 120
176 B08
A2JC31-23 +UNIT 2 SW
201 A2PC31C-07
A2JC31-40 +UNIT 4 SW
201 A2PC31C-14
+ UNIT 2^1
- UNIT 2^1
+ UNIT 2^2
- UNIT 2^2
A2JB31-02
401 A2PB31A-02
A2JB31-25
401 A2PB31A-13
A2JB31-03
401 A2PA31A-03
A2JB31-26
401 A2PA31A-12
176 B09
201 A2PC31C-13 41 +UNIT B SW
120 TM +ENABLE CNTL SEL TAG
+ UNIT 2^3
- UNIT 2^3
+ TAG 3
- TAG 3
A2JB31-04
401 A2PB31A-04
A2JB31-27
401 A2PB31A-11
A2JA31-04
401 A2PA31A-04
A2JA31-27
401 A2PA31A-11
176 B10
NC
NOT USED
NOT USED
+ OPEN CABLE XMTR
- OPEN CABLE XMTR
A2JA31-06
401 A2PA31A-06
A2JA31-29
401 A2PA31A-09
A2JB31-09
401 A2PB31B-01
A2JB31-32
401 A2PB31B-14
F3 DRVR 176 B15
114 NI +NRZ WRT DATA
118 SV +FTU WRT CLK
X/Y F2,3-
F2 F2,3-
X/Y F1,3-
F1 F1,3-
+ WRT DATA
- WRT DATA
+ WRT CLK
- WRT CLK
A2JA31-13
402 A2PA31B-05
A2JA31-12
402 A2PA31B-04
A2JA31-35
402 A2PA31B-11
A2JA31-36
402 A2PA31B-10
A2JA31-14
402 A2PA31B-06
A2JA31-37
402 A2PA31B-09
A2JC31-35
201 A2PC31B-11 +SEQ PWR SW
+ SEQ PWR SW
A2JA31-09
402 A2PA31B-01
A2JA31-32
402 A2PA31B-14
CONTROL DATA
NORMANDALE DIVISION
TRANSMITTERS II
T83048/C
CODE IDENT 19333
C
83319600
D
B
SHEET 27
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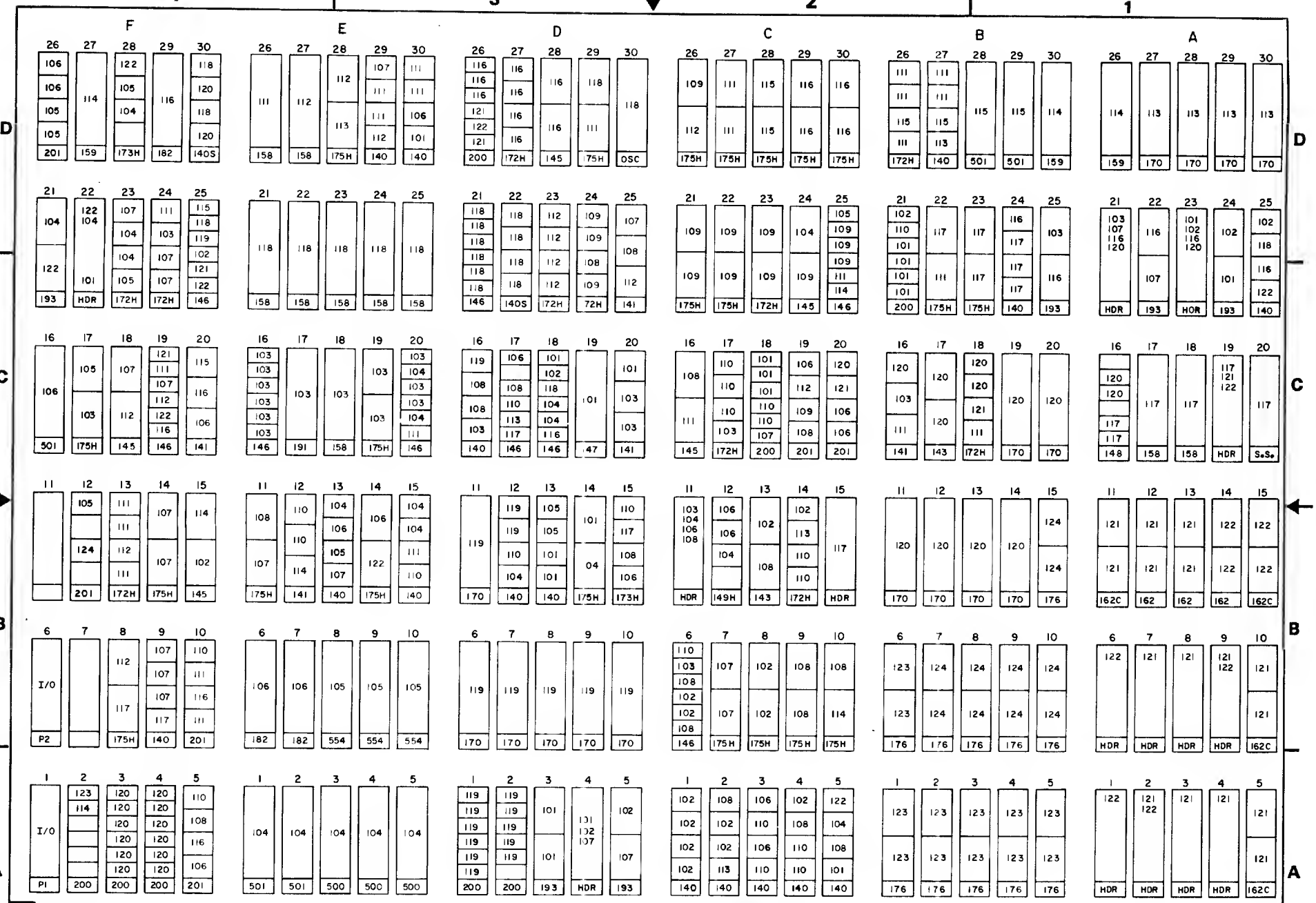
CROSS REF NO 124
CROSS REF NO 124



NOTES

1. BOTTOM DESIGNATION IN EACH LOCATION IS I.C. TYPE ; OTHER NUMBERS ARE LOGIC DIAGRAM CROSS-REFERENCE PAGES WHERE CIRCUIT SECTION IS SHOWN.
2. LOCATIONS OR I.C. SECTIONS THAT ARE UNUSED ARE LEFT BLANK
3. MISCELLANEOUS DESIGNATIONS:
   HDR = RESISTOR HEADER
   OSC = CRYSTAL OSCILLATOR
   S.S. = SECTOR SWITCHES (8)
   I/O = I/O BYPASS CONNECTOR

CROSS REF NO 125

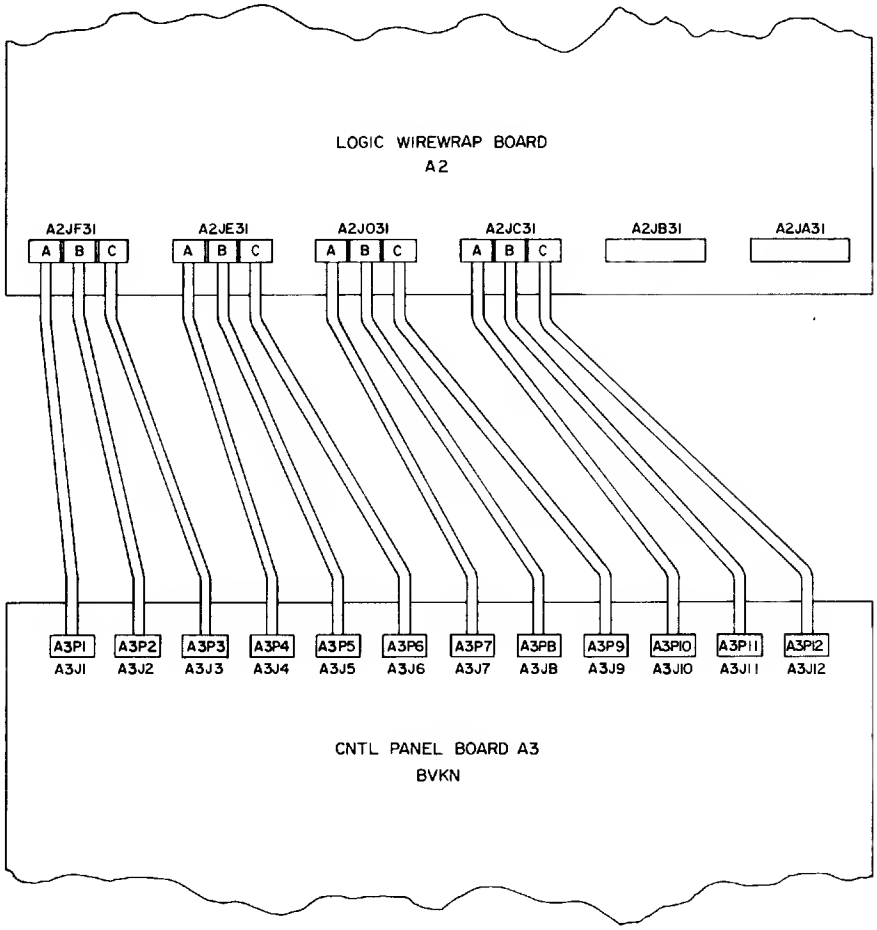
CONTROL DATA
NORMANDALE DIVISION

LOGIC BOARD
I.C. PLACEMENT

TB3048/C

CODE IDENT 19333 | C | 83319600 | D | B

CROSS REF NO 125 | SHEET 28 | PAGE 5-28



NOTE:

1 NO ATTEMPT IS MADE TO SHOW DIRECTION OF SIGNAL FLOW IN OR OUT OF THE PLUGS. THIS IS DETERMINED BY REFERRING TO SHEETS CONTAINING JACK CONNECTIONS

CONTROL DATA
NORMANDALE DIVISION

LOGIC BOARD TO CONTROL PANEL CABLING

TB304B/C

CODE IDENT	DRAWING NO	SHEET	PAGE
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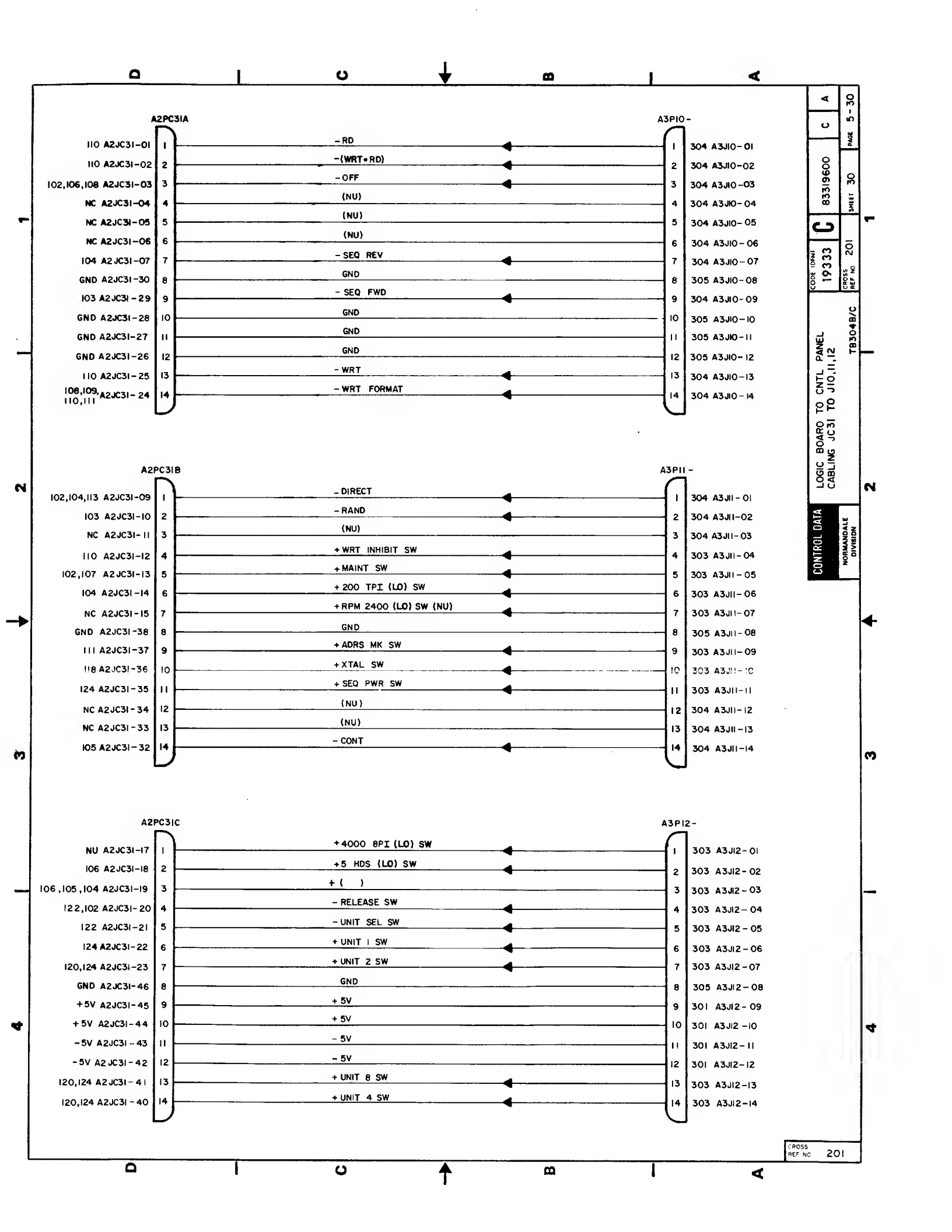
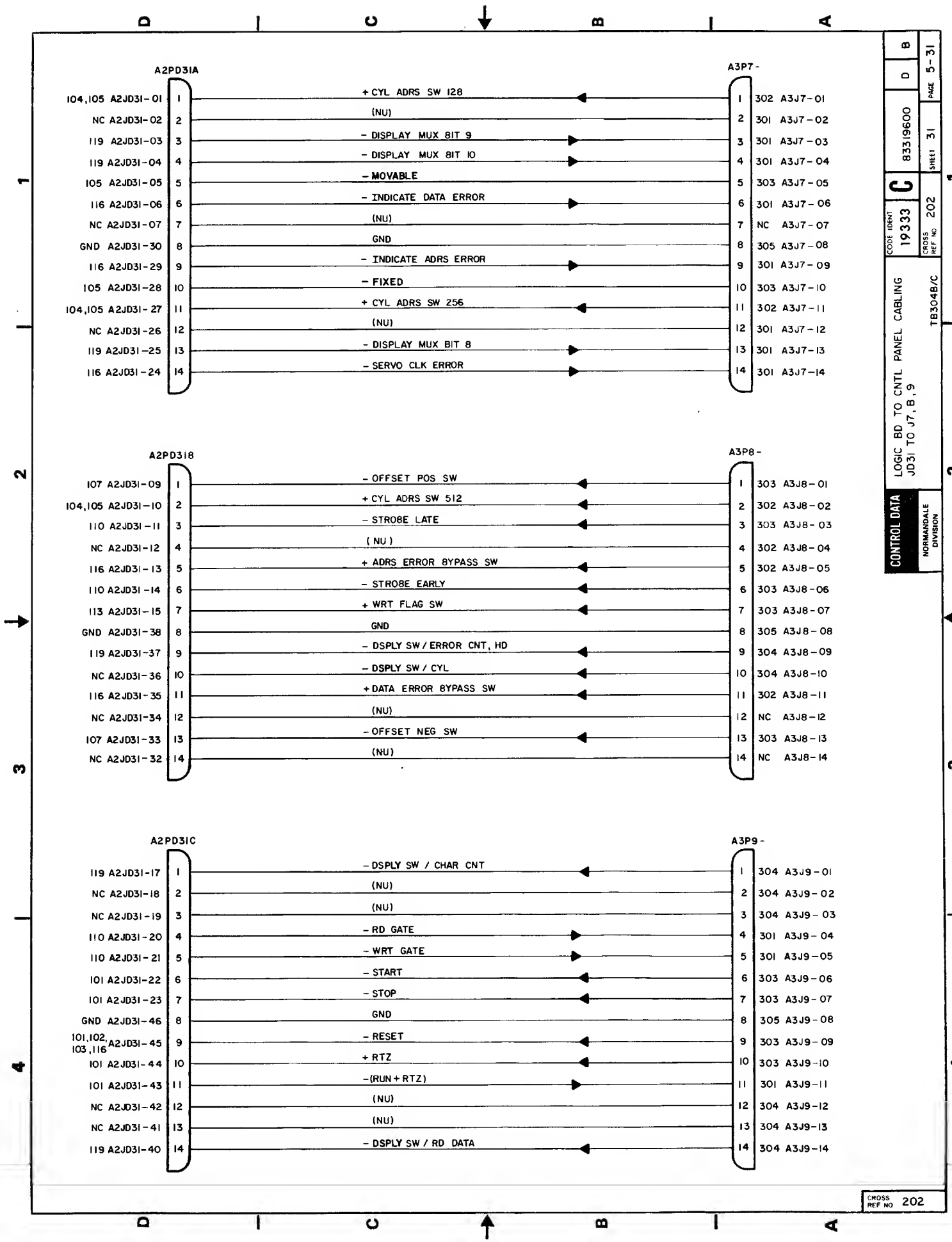
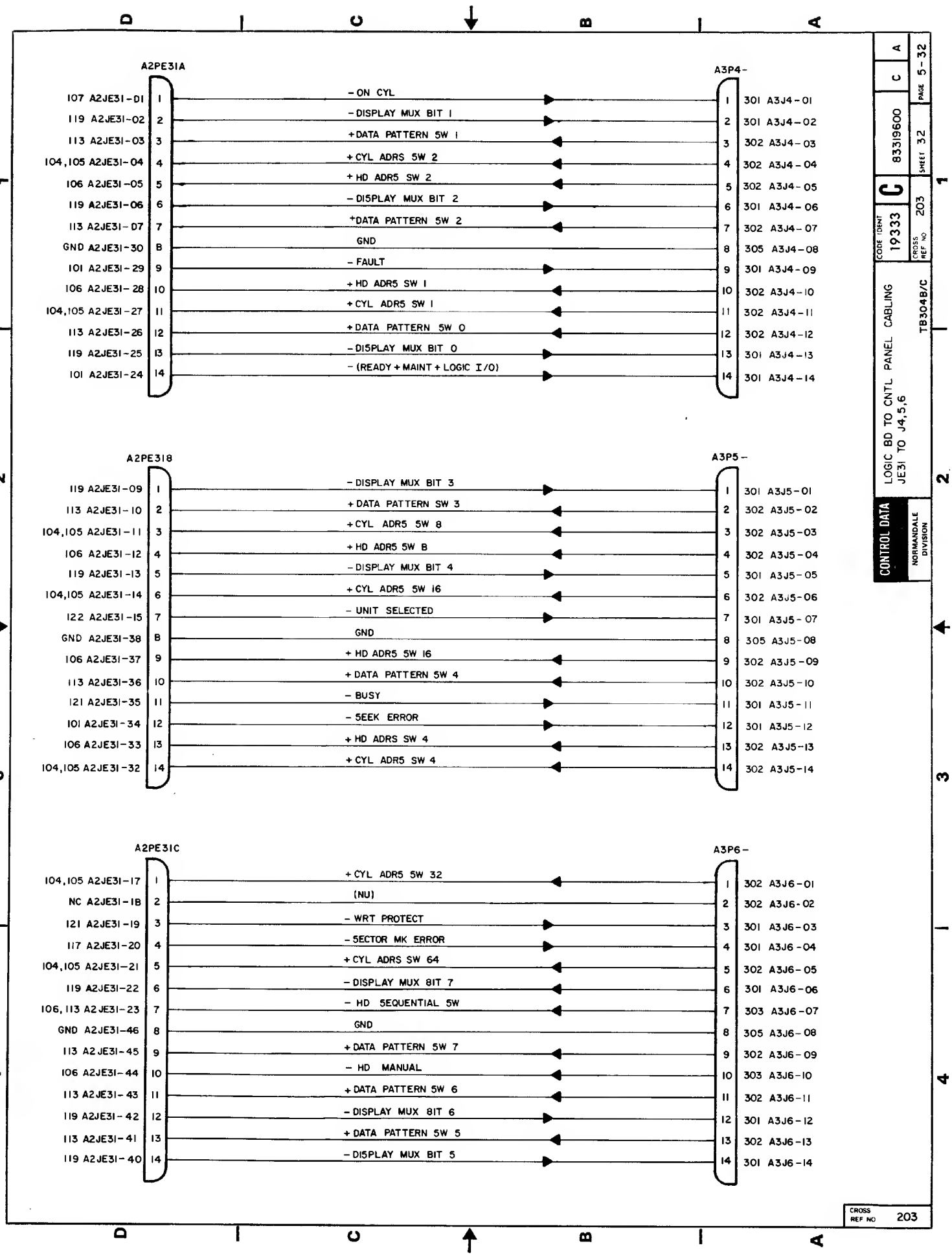
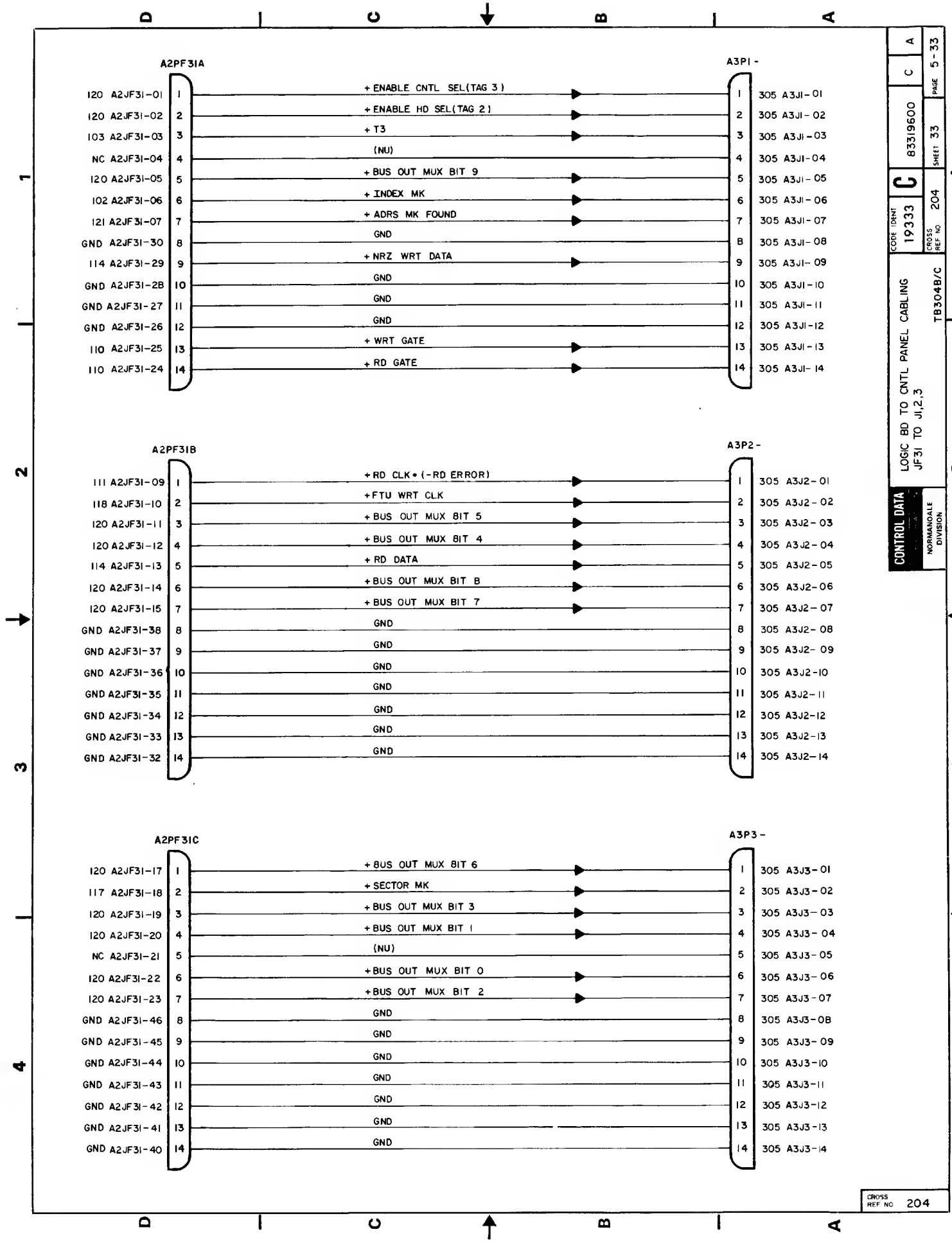
CROSS REF NO	C		C
200			A

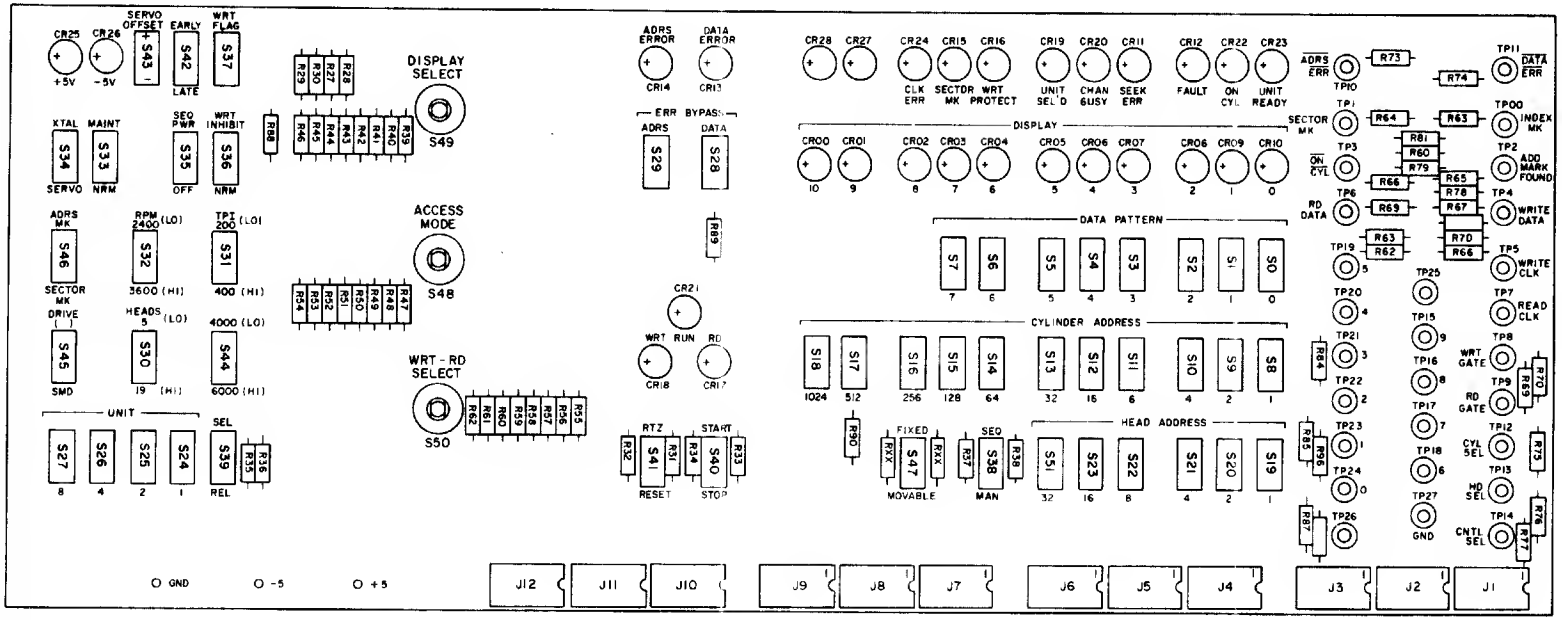
CROSS REF NO 200

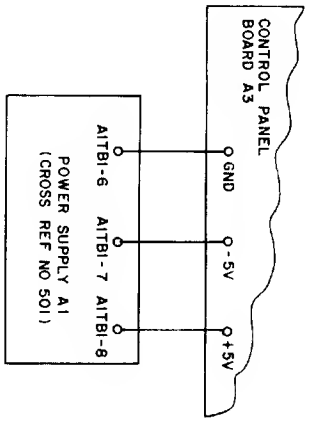

A2PC31A
A3P10-
110 A2JC31-01 1 -RD 1 304 A3J10-01
110 A2JC31-02 2 -(WRT•RD) 2 304 A3J10-02
102,106,108 A2JC31-03 3 -OFF 3 304 A3J10-03
NC A2JC31-04 4 (NU) 4 304 A3J10-04
NC A2JC31-05 5 (NU) 5 304 A3J10-05
NC A2JC31-06 6 (NU) 6 304 A3J10-06
104 A2JC31-07 7 -SEQ REV 7 304 A3J10-07
GND A2JC31-30 8 GND 8 305 A3J10-08
103 A2JC31-29 9 -SEQ FWD 9 304 A3J10-09
GND A2JC31-28 10 GND 10 305 A3J10-10
GND A2JC31-27 11 GND 11 305 A3J10-11
GND A2JC31-26 12 GND 12 305 A3J10-12
110 A2JC31-25 13 -WRT 13 304 A3J10-13
108,109,110,111 A2JC31-24 14 -WRT FORMAT 14 304 A3J10-14
A2PC31B
A3P11-
102,104,113 A2JC31-09 1 -DIRECT 1 304 A3J11-01
103 A2JC31-10 2 -RAND 2 304 A3J11-02
NC A2JC31-11 3 (NU) 3 304 A3J11-03
110 A2JC31-12 4 +WRT INHIBIT SW 4 303 A3J11-04
102,107 A2JC31-13 5 +MAINT SW 5 303 A3J11-05
104 A2JC31-14 6 +200 TPI (LO) SW 6 303 A3J11-06
NC A2JC31-15 7 +RPM 2400 (LO) SW (NU) 7 303 A3J11-07
GND A2JC31-38 8 GND 8 305 A3J11-08
111 A2JC31-37 9 +ADRS MK SW 9 303 A3J11-09
118 A2JC31-36 10 +XTAL SW 10 303 A3J11-10
124 A2JC31-35 11 +SEQ PWR SW 11 303 A3J11-11
NC A2JC31-34 12 (NU) 12 304 A3J11-12
NC A2JC31-33 13 (NU) 13 304 A3J11-13
105 A2JC31-32 14 -CONT 14 304 A3J11-14
A2PC31C
A3P12-
NU A2JC31-17 1 +4000 8PI (LO) SW 1 303 A3J12-01
106 A2JC31-18 2 +5 HDS (LO) SW 2 303 A3J12-02
106,105,104 A2JC31-19 3 +( ) 3 303 A3J12-03
122,102 A2JC31-20 4 -RELEASE SW 4 303 A3J12-04
122 A2JC31-21 5 -UNIT SEL SW 5 303 A3J12-05
124 A2JC31-22 6 +UNIT 1 SW 6 303 A3J12-06
120,124 A2JC31-23 7 +UNIT 2 SW 7 303 A3J12-07
GND A2JC31-46 8 GND 8 305 A3J12-08
+5V A2JC31-45 9 +5V 9 301 A3J12-09
+5V A2JC31-44 10 +5V 10 301 A3J12-10
-5V A2JC31-43 11 -5V 11 301 A3J12-11
-5V A2JC31-42 12 -5V 12 301 A3J12-12
120,124 A2JC31-41 13 +UNIT 8 SW 13 303 A3J12-13
120,124 A2JC31-40 14 +UNIT 4 SW 14 303 A3J12-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BOARD TO CNTL PANEL CABLING JC31 TO J10,11,12
TB304B/C
CODE IDENT 19333
C
83319600
A
C
PAGE 5-30
SHEET 30
CROSS REF NO 201
CROSS REF NO 201


A2PD31A
A3P7-
104,105 A2JD31-01 1 + CYL ADRS SW 128 1 302 A3J7-01
NC A2JD31-02 2 (NU) 2 301 A3J7-02
119 A2JD31-03 3 - DISPLAY MUX BIT 9 3 301 A3J7-03
119 A2JD31-04 4 - DISPLAY MUX BIT 10 4 301 A3J7-04
105 A2JD31-05 5 - MOVABLE 5 303 A3J7-05
116 A2JD31-06 6 - INDICATE DATA ERROR 6 301 A3J7-06
NC A2JD31-07 7 (NU) 7 NC A3J7-07
GND A2JD31-30 8 GND 8 305 A3J7-08
116 A2JD31-29 9 - INDICATE ADRS ERROR 9 301 A3J7-09
105 A2JD31-28 10 - FIXED 10 303 A3J7-10
104,105 A2JD31-27 11 + CYL ADRS SW 256 11 302 A3J7-11
NC A2JD31-26 12 (NU) 12 301 A3J7-12
119 A2JD31-25 13 - DISPLAY MUX BIT 8 13 301 A3J7-13
116 A2JD31-24 14 - SERVO CLK ERROR 14 301 A3J7-14
A2PD31B
A3P8-
107 A2JD31-09 1 - OFFSET POS SW 1 303 A3J8-01
104,105 A2JD31-10 2 + CYL ADRS SW 512 2 302 A3J8-02
110 A2JD31-11 3 - STROBE LATE 3 303 A3J8-03
NC A2JD31-12 4 (NU) 4 302 A3J8-04
116 A2JD31-13 5 + ADRS ERROR BYPASS SW 5 302 A3J8-05
110 A2JD31-14 6 - STROBE EARLY 6 303 A3J8-06
113 A2JD31-15 7 + WRT FLAG SW 7 303 A3J8-07
GND A2JD31-38 8 GND 8 305 A3J8-08
119 A2JD31-37 9 - DSPLY SW / ERROR CNT, HD 9 304 A3J8-09
NC A2JD31-36 10 - DSPLY SW / CYL 10 304 A3J8-10
116 A2JD31-35 11 + DATA ERROR BYPASS SW 11 302 A3J8-11
NC A2JD31-34 12 (NU) 12 NC A3J8-12
107 A2JD31-33 13 - OFFSET NEG SW 13 303 A3J8-13
NC A2JD31-32 14 (NU) 14 NC A3J8-14
A2PD31C
A3P9-
119 A2JD31-17 1 - DSPLY SW / CHAR CNT 1 304 A3J9-01
NC A2JD31-18 2 (NU) 2 304 A3J9-02
NC A2JD31-19 3 (NU) 3 304 A3J9-03
110 A2JD31-20 4 - RD GATE 4 301 A3J9-04
110 A2JD31-21 5 - WRT GATE 5 301 A3J9-05
101 A2JD31-22 6 - START 6 303 A3J9-06
101 A2JD31-23 7 - STOP 7 303 A3J9-07
GND A2JD31-46 8 GND 8 305 A3J9-08
101,102,103,116 A2JD31-45 9 - RESET 9 303 A3J9-09
101 A2JD31-44 10 + RTZ 10 303 A3J9-10
101 A2JD31-43 11 -(RUN + RTZ) 11 301 A3J9-11
NC A2JD31-42 12 (NU) 12 304 A3J9-12
NC A2JD31-41 13 (NU) 13 304 A3J9-13
119 A2JD31-40 14 - DSPLY SW / RD DATA 14 304 A3J9-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BD TO CNTL PANEL CABLING
JD31 TO J7, 8, 9
TB304B/C
CODE IDENT 19333
C
83319600
B
D
PAGE 5-31
SHEET 31
CROSS REF NO 202
CROSS REF NO 202


A2PE31A
A3P4-
107 A2JE31-01 1 - ON CYL 1 301 A3J4-01
119 A2JE31-02 2 - DISPLAY MUX BIT 1 2 301 A3J4-02
113 A2JE31-03 3 + DATA PATTERN SW 1 3 302 A3J4-03
104,105 A2JE31-04 4 + CYL ADRS SW 2 4 302 A3J4-04
106 A2JE31-05 5 + HD ADRS SW 2 5 302 A3J4-05
119 A2JE31-06 6 - DISPLAY MUX BIT 2 6 301 A3J4-06
113 A2JE31-07 7 + DATA PATTERN SW 2 7 302 A3J4-07
GND A2JE31-30 8 GND 8 305 A3J4-08
101 A2JE31-29 9 - FAULT 9 301 A3J4-09
106 A2JE31-28 10 + HD ADRS SW 1 10 302 A3J4-10
104,105 A2JE31-27 11 + CYL ADRS SW 1 11 302 A3J4-11
113 A2JE31-26 12 + DATA PATTERN SW 0 12 302 A3J4-12
119 A2JE31-25 13 - DISPLAY MUX BIT 0 13 301 A3J4-13
101 A2JE31-24 14 - (READY + MAINT + LOGIC I/O) 14 301 A3J4-14
A2PE31B
A3P5-
119 A2JE31-09 1 - DISPLAY MUX BIT 3 1 301 A3J5-01
113 A2JE31-10 2 + DATA PATTERN SW 3 2 302 A3J5-02
104,105 A2JE31-11 3 + CYL ADRS SW 8 3 302 A3J5-03
106 A2JE31-12 4 + HD ADRS SW 8 4 302 A3J5-04
119 A2JE31-13 5 - DISPLAY MUX BIT 4 5 301 A3J5-05
104,105 A2JE31-14 6 + CYL ADRS SW 16 6 302 A3J5-06
122 A2JE31-15 7 - UNIT SELECTED 7 301 A3J5-07
GND A2JE31-38 8 GND 8 305 A3J5-08
106 A2JE31-37 9 + HD ADRS SW 16 9 302 A3J5-09
113 A2JE31-36 10 + DATA PATTERN SW 4 10 302 A3J5-10
121 A2JE31-35 11 - BUSY 11 301 A3J5-11
101 A2JE31-34 12 - SEEK ERROR 12 301 A3J5-12
106 A2JE31-33 13 + HD ADRS SW 4 13 302 A3J5-13
104,105 A2JE31-32 14 + CYL ADRS SW 4 14 302 A3J5-14
A2PE31C
A3P6-
104,105 A2JE31-17 1 + CYL ADRS SW 32 1 302 A3J6-01
NC A2JE31-18 2 (NU) 2 302 A3J6-02
121 A2JE31-19 3 - WRT PROTECT 3 301 A3J6-03
117 A2JE31-20 4 - SECTOR MK ERROR 4 301 A3J6-04
104,105 A2JE31-21 5 + CYL ADRS SW 64 5 302 A3J6-05
119 A2JE31-22 6 - DISPLAY MUX BIT 7 6 301 A3J6-06
106,113 A2JE31-23 7 - HD SEQUENTIAL SW 7 303 A3J6-07
GND A2JE31-46 8 GND 8 305 A3J6-08
113 A2JE31-45 9 + DATA PATTERN SW 7 9 302 A3J6-09
106 A2JE31-44 10 - HD MANUAL 10 303 A3J6-10
113 A2JE31-43 11 + DATA PATTERN SW 6 11 302 A3J6-11
119 A2JE31-42 12 - DISPLAY MUX BIT 6 12 301 A3J6-12
113 A2JE31-41 13 + DATA PATTERN SW 5 13 302 A3J6-13
119 A2JE31-40 14 - DISPLAY MUX BIT 5 14 301 A3J6-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BD TO CNTL PANEL CABLING
J31 TO J4,5,6
TB304B/C
CODE IDENT 19333
C
83319600
SHEET 32
PAGE 5-32
A
C
CROSS REF NO 203
CROSS REF NO 203


A2PF31A
A3P1 -
120 A2JF31-01 1 + ENABLE CNTL SEL(TAG 3) 1 305 A3J1-01
120 A2JF31-02 2 + ENABLE HD SEL(TAG 2) 2 305 A3J1-02
103 A2JF31-03 3 + T3 3 305 A3J1-03
NC A2JF31-04 4 (NU) 4 305 A3J1-04
120 A2JF31-05 5 + BUS OUT MUX BIT 9 5 305 A3J1-05
102 A2JF31-06 6 + INDEX MK 6 305 A3J1-06
121 A2JF31-07 7 + ADRS MK FOUND 7 305 A3J1-07
GND A2JF31-30 8 GND 8 305 A3J1-08
114 A2JF31-29 9 + NRZ WRT DATA 9 305 A3J1-09
GND A2JF31-28 10 GND 10 305 A3J1-10
GND A2JF31-27 11 GND 11 305 A3J1-11
GND A2JF31-26 12 GND 12 305 A3J1-12
110 A2JF31-25 13 + WRT GATE 13 305 A3J1-13
110 A2JF31-24 14 + RD GATE 14 305 A3J1-14
A2PF31B
A3P2 -
111 A2JF31-09 1 + RD CLK • (-RD ERROR) 1 305 A3J2-01
118 A2JF31-10 2 + FTU WRT CLK 2 305 A3J2-02
120 A2JF31-11 3 + BUS OUT MUX BIT 5 3 305 A3J2-03
120 A2JF31-12 4 + BUS OUT MUX BIT 4 4 305 A3J2-04
114 A2JF31-13 5 + RD DATA 5 305 A3J2-05
120 A2JF31-14 6 + BUS OUT MUX BIT 6 6 305 A3J2-06
120 A2JF31-15 7 + BUS OUT MUX BIT 7 7 305 A3J2-07
GND A2JF31-38 8 GND 8 305 A3J2-08
GND A2JF31-37 9 GND 9 305 A3J2-09
GND A2JF31-36 10 GND 10 305 A3J2-10
GND A2JF31-35 11 GND 11 305 A3J2-11
GND A2JF31-34 12 GND 12 305 A3J2-12
GND A2JF31-33 13 GND 13 305 A3J2-13
GND A2JF31-32 14 GND 14 305 A3J2-14
A2PF31C
A3P3 -
120 A2JF31-17 1 + BUS OUT MUX BIT 6 1 305 A3J3-01
117 A2JF31-18 2 + SECTOR MK 2 305 A3J3-02
120 A2JF31-19 3 + BUS OUT MUX BIT 3 3 305 A3J3-03
120 A2JF31-20 4 + BUS OUT MUX BIT 1 4 305 A3J3-04
NC A2JF31-21 5 (NU) 5 305 A3J3-05
120 A2JF31-22 6 + BUS OUT MUX BIT 0 6 305 A3J3-06
120 A2JF31-23 7 + BUS OUT MUX BIT 2 7 305 A3J3-07
GND A2JF31-46 8 GND 8 305 A3J3-08
GND A2JF31-45 9 GND 9 305 A3J3-09
GND A2JF31-44 10 GND 10 305 A3J3-10
GND A2JF31-43 11 GND 11 305 A3J3-11
GND A2JF31-42 12 GND 12 305 A3J3-12
GND A2JF31-41 13 GND 13 305 A3J3-13
GND A2JF31-40 14 GND 14 305 A3J3-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BD TO CNTL PANEL CABLING
JF31 TO J1,2,3
TB304B/C
CODE IDENT 19333
C
83319600
SHEET 33
PAGE 5-33
A
C
CROSS REF NO 204
CROSS REF NO 204



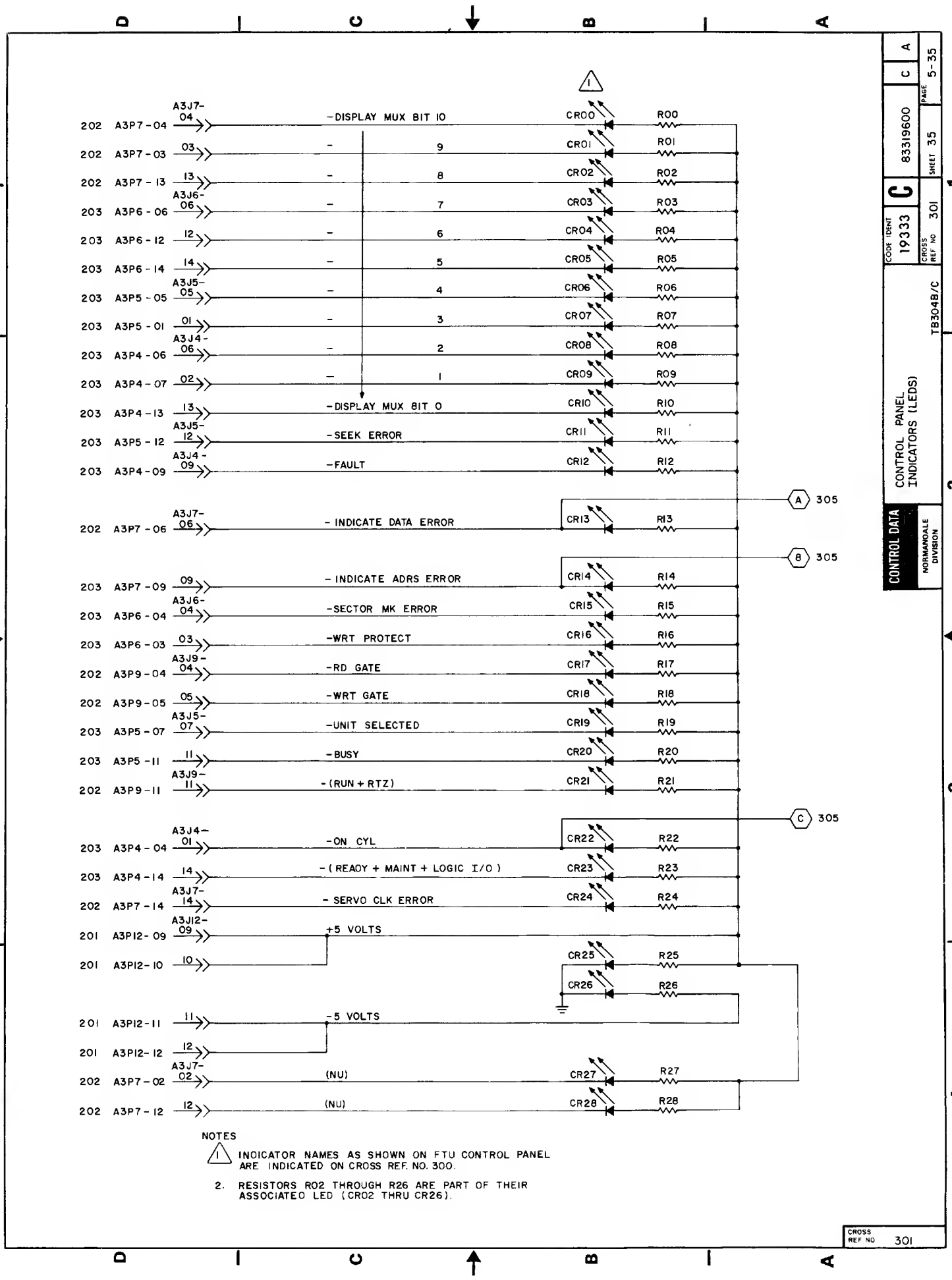


NOTES:

1. THESE ELEMENTS ARE NOT INSTALLED ON PC BOARD
2. RESISTORS R02 THRU R26 ARE PART OF THEIR ASSOCIATED LED (CR02 THRU CR26)
3. REFER TO CROSS REF NO 200 FOR CABLES CONNECTING CNTL PANEL TO LOGIC BOARD
4. POWER AND GROUND CONNECTIONS

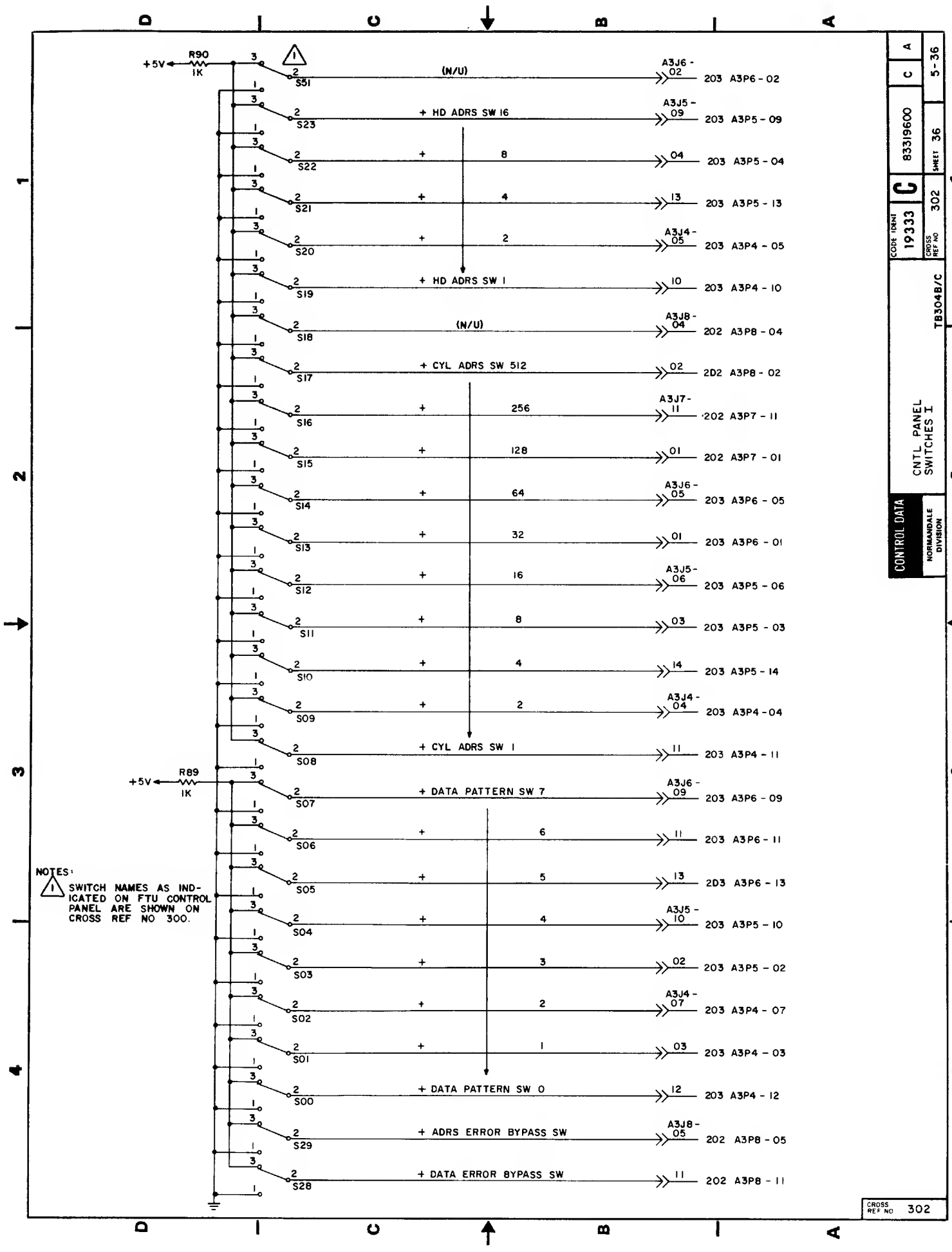
CROSS REF NO 300

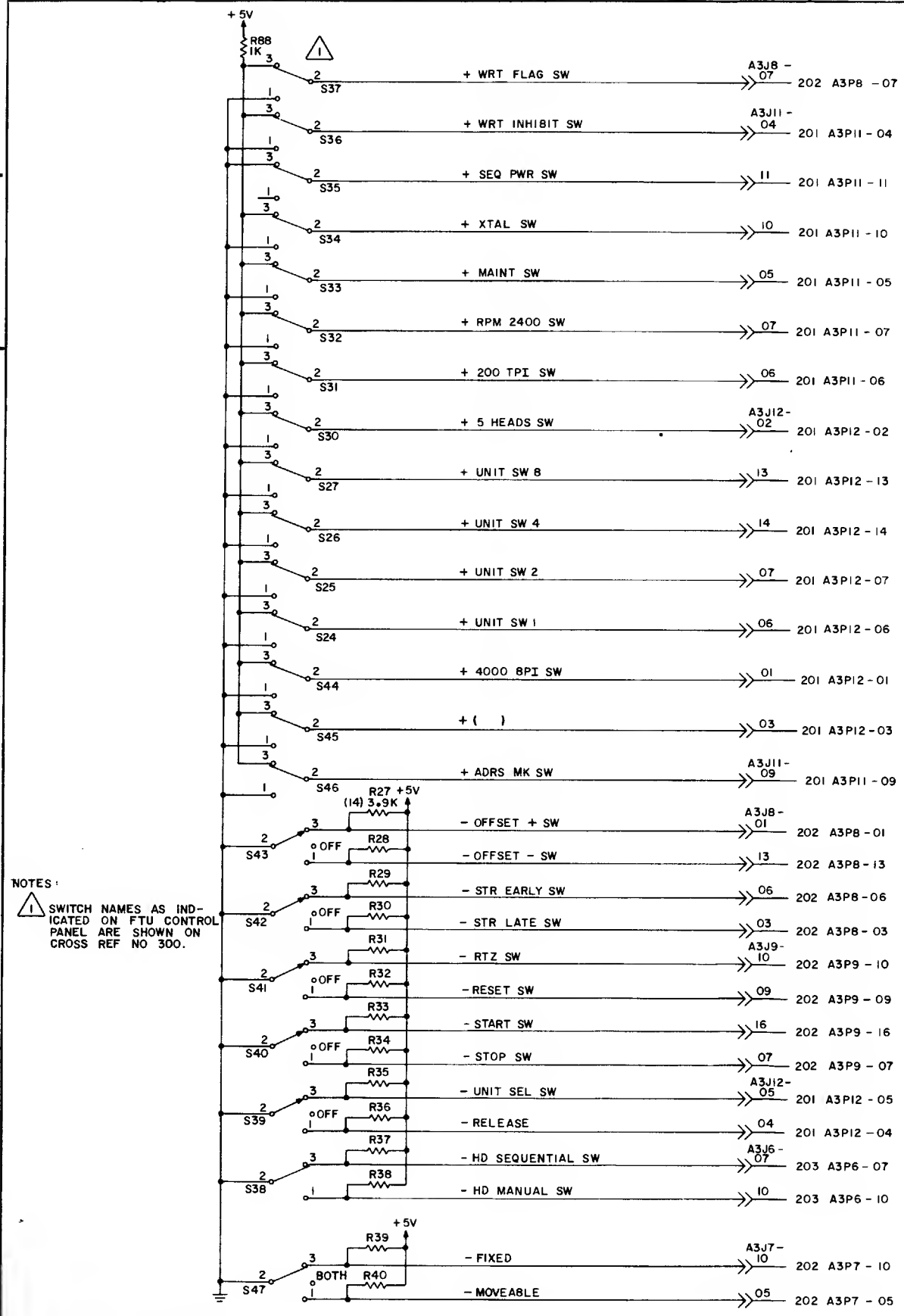
CONTROL DATA NORMANDALE DIVISION	CONTROL PANEL TB304B/C	CODE IDENT 19333	C	83319600	C A
		CROSS REF NO 300		SHEET 34	PAGE 5-34



NOTES

1. INDICATOR NAMES AS SHOWN ON FTU CONTROL PANEL ARE INDICATED ON CROSS REF. NO. 300.
2. RESISTORS R02 THROUGH R26 ARE PART OF THEIR ASSOCIATED LED (CR02 THRU CR26).


+5V
R90
1K
+5V
R89
1K
S51 (N/U) A3J6-02 203 A3P6-02
S23 + HD ADRS SW 16 A3J5-09 203 A3P5-09
S22 + 8 04 203 A3P5-04
S21 + 4 13 203 A3P5-13
S20 + 2 A3J4-05 203 A3P4-05
S19 + HD ADRS SW 1 10 203 A3P4-10
S18 (N/U) A3J8-04 202 A3P8-04
S17 + CYL ADRS SW 512 02 2D2 A3P8-02
S16 + 256 A3J7-11 202 A3P7-11
S15 + 128 01 202 A3P7-01
S14 + 64 A3J6-05 203 A3P6-05
S13 + 32 01 203 A3P6-01
S12 + 16 A3J5-06 203 A3P5-06
S11 + 8 03 203 A3P5-03
S10 + 4 14 203 A3P5-14
S09 + 2 A3J4-04 203 A3P4-04
S08 + CYL ADRS SW 1 11 203 A3P4-11
S07 + DATA PATTERN SW 7 A3J6-09 203 A3P6-09
S06 + 6 11 203 A3P6-11
S05 + 5 13 2D3 A3P6-13
S04 + 4 A3J5-10 203 A3P5-10
S03 + 3 02 203 A3P5-02
S02 + 2 A3J4-07 203 A3P4-07
S01 + 1 03 203 A3P4-03
S00 + DATA PATTERN SW 0 12 203 A3P4-12
S29 + ADRS ERROR BYPASS SW A3J8-05 202 A3P8-05
S28 + DATA ERROR BYPASS SW 11 202 A3P8-11
NOTES:
1. SWITCH NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.
CONTROL DATA NORMANDALE DIVISION
CNTL PANEL SWITCHES I
TB304B/C
CODE IDENT 19333
C
CROSS REF NO 302
A
C
83319600
SHEET 36
5-36
CROSS REF NO 302



NOTES:

1. SWITCH NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.

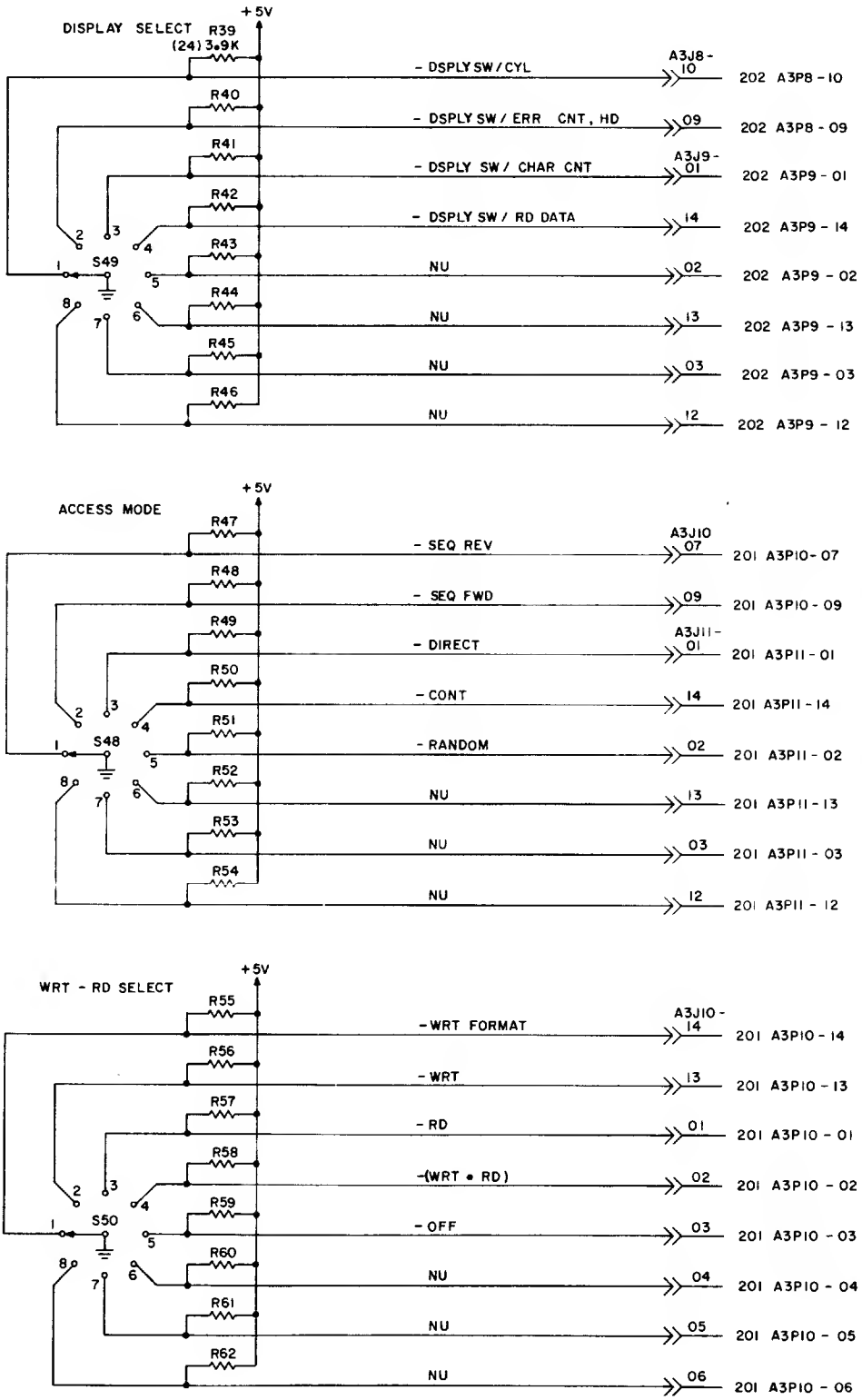
CONTROL DATA
NORMANDALE DIVISION

CNTL PANEL SWITCHES II

TB304B/C

CODE IDENT 19333 | CROSS REF NO 303 | C | SHEET 37 | 83319600 | C | A | PAGE 5-37

CROSS REF NO 303



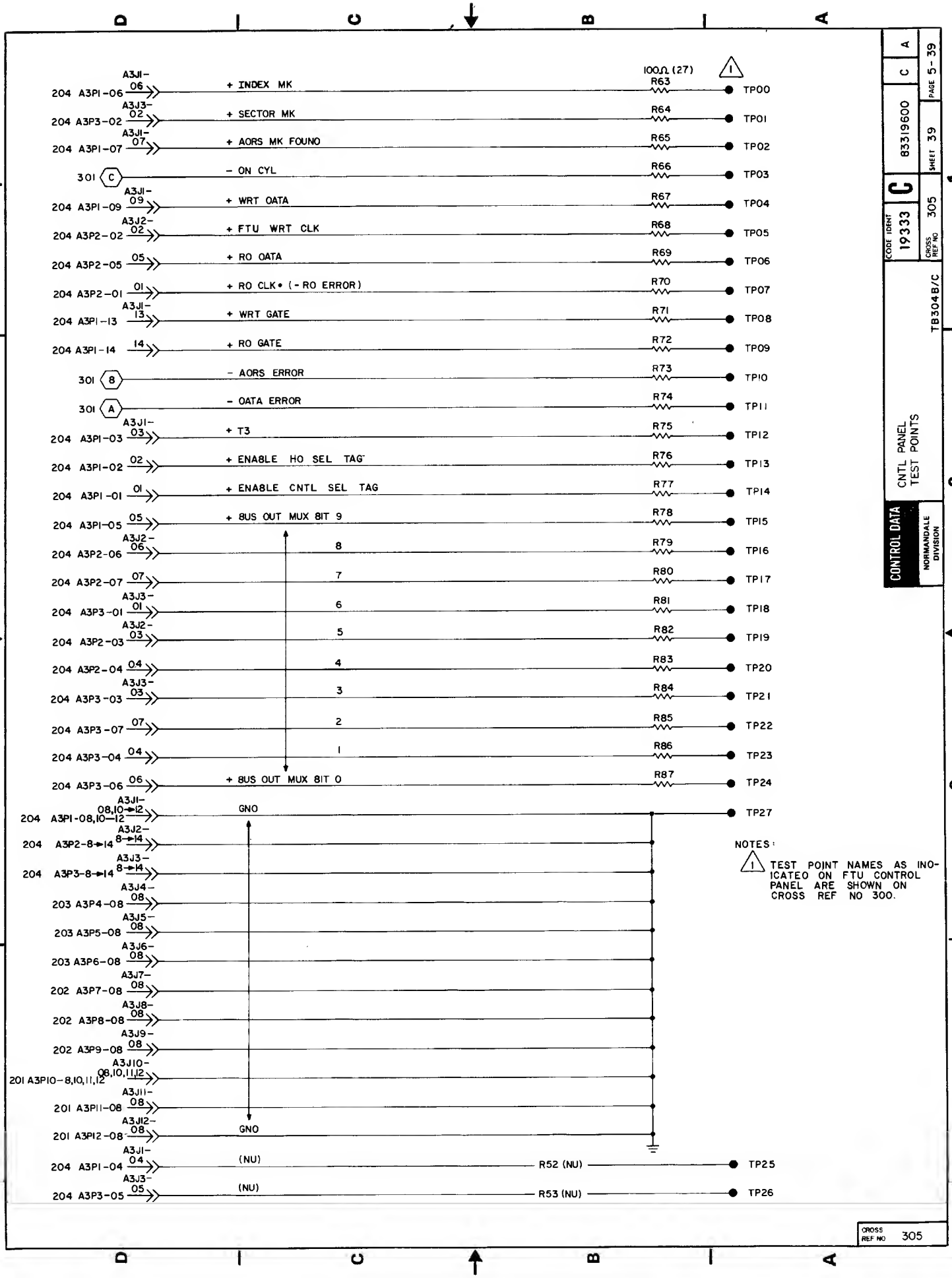
CONTROL DATA
NORMANDALE DIVISION

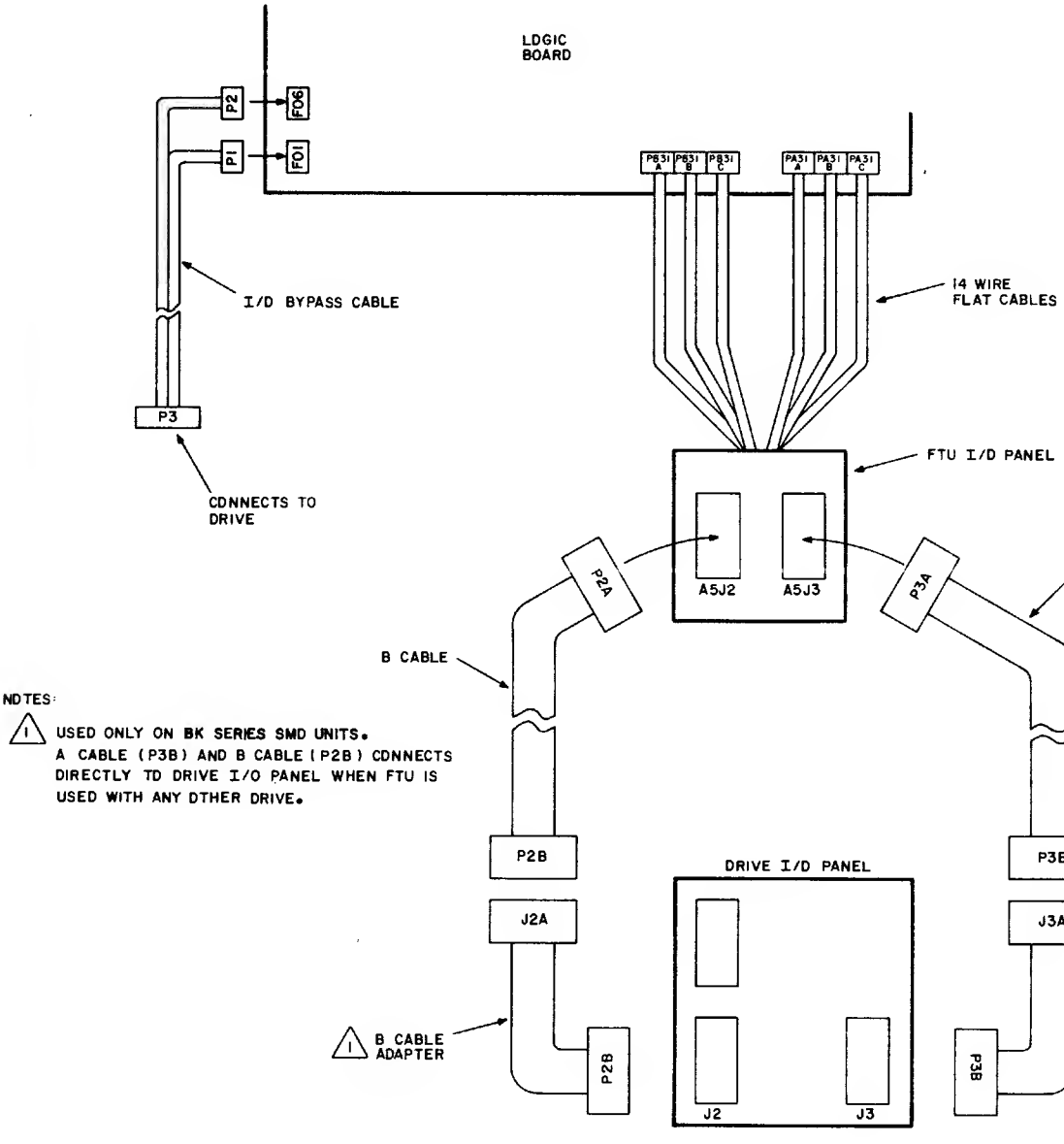
CNTL PANEL SWITCHES III

TB304B/C

CODE IDENT 19333 | C | CROSS REF NO 304

83319600 | D | B | SHEET 38 | PAGE 5 - 38


100Ω (27) ⚠1
204 A3P1-06 A3J1-06 + INDEX MK R63 TP00
204 A3P3-02 A3J3-02 + SECTOR MK R64 TP01
204 A3P1-07 A3J1-07 + AORS MK FOUND R65 TP02
301 C - ON CYL R66 TP03
204 A3P1-09 A3J1-09 + WRT DATA R67 TP04
204 A3P2-02 A3J2-02 + FTU WRT CLK R68 TP05
204 A3P2-05 05 + RO DATA R69 TP06
204 A3P2-01 01 + RO CLK• (-RO ERROR) R70 TP07
204 A3P1-13 A3J1-13 + WRT GATE R71 TP08
204 A3P1-14 14 + RO GATE R72 TP09
301 8 - AORS ERROR R73 TP10
301 A - DATA ERROR R74 TP11
204 A3P1-03 A3J1-03 + T3 R75 TP12
204 A3P1-02 02 + ENABLE HO SEL TAG R76 TP13
204 A3P1-01 01 + ENABLE CNTL SEL TAG R77 TP14
204 A3P1-05 05 + BUS OUT MUX BIT 9 R78 TP15
204 A3P2-06 A3J2-06 8 R79 TP16
204 A3P2-07 07 7 R80 TP17
204 A3P3-01 A3J3-01 6 R81 TP18
204 A3P2-03 A3J2-03 5 R82 TP19
204 A3P2-04 04 4 R83 TP20
204 A3P3-03 A3J3-03 3 R84 TP21
204 A3P3-07 07 2 R85 TP22
204 A3P3-04 04 1 R86 TP23
204 A3P3-06 06 + BUS OUT MUX BIT 0 R87 TP24
204 A3P1-08,10-12 A3J1-08,10→12 GND TP27
204 A3P2-8→14 A3J2-8→14
204 A3P3-8→14 A3J3-8→14
203 A3P4-08 A3J4-08
203 A3P5-08 A3J5-08
203 A3P6-08 A3J6-08
202 A3P7-08 A3J7-08
202 A3P8-08 A3J8-08
202 A3P9-08 A3J9-08
201 A3P10-8,10,11,12 A3J10-08,10,11,12
201 A3P11-08 A3J11-08
201 A3P12-08 A3J12-08 GND
204 A3P1-04 A3J1-04 (NU) R52 (NU) TP25
204 A3P3-05 A3J3-05 (NU) R53 (NU) TP26
NOTES:
⚠1 TEST POINT NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.
CONTROL DATA NORMANDALE DIVISION
CNTL PANEL TEST POINTS
TB304B/C
CODE IDENT 19333
CROSS REF NO 305
C
83319600
SHEET 39
PAGE 5-39
A
C
CROSS REF NO 305



NOTES:

1. USED ONLY ON BK SERIES SMD UNITS. A CABLE (P3B) AND B CABLE (P2B) CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.

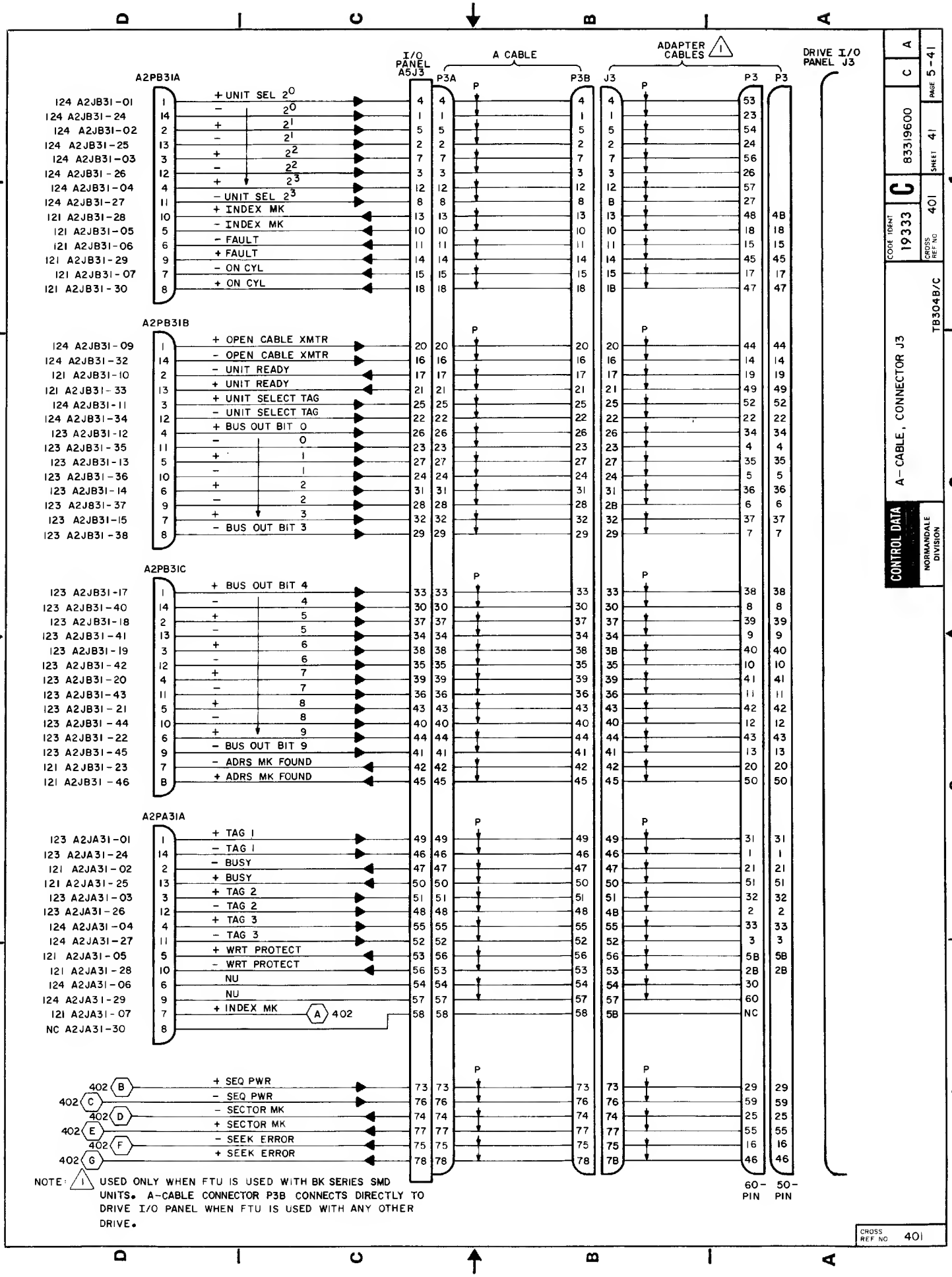
CONTROL DATA
NORMANDALE DIVISION

I/O CABLING

TB304B/C

CODE IDENT 19333 | C | 83319600 | A

CROSS REF NO 400 | SHEET 40 | PAGE 5-40



NOTE: 1 USED ONLY WHEN FTU IS USED WITH BK SERIES SMD UNITS. A-CABLE CONNECTOR P3B CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.

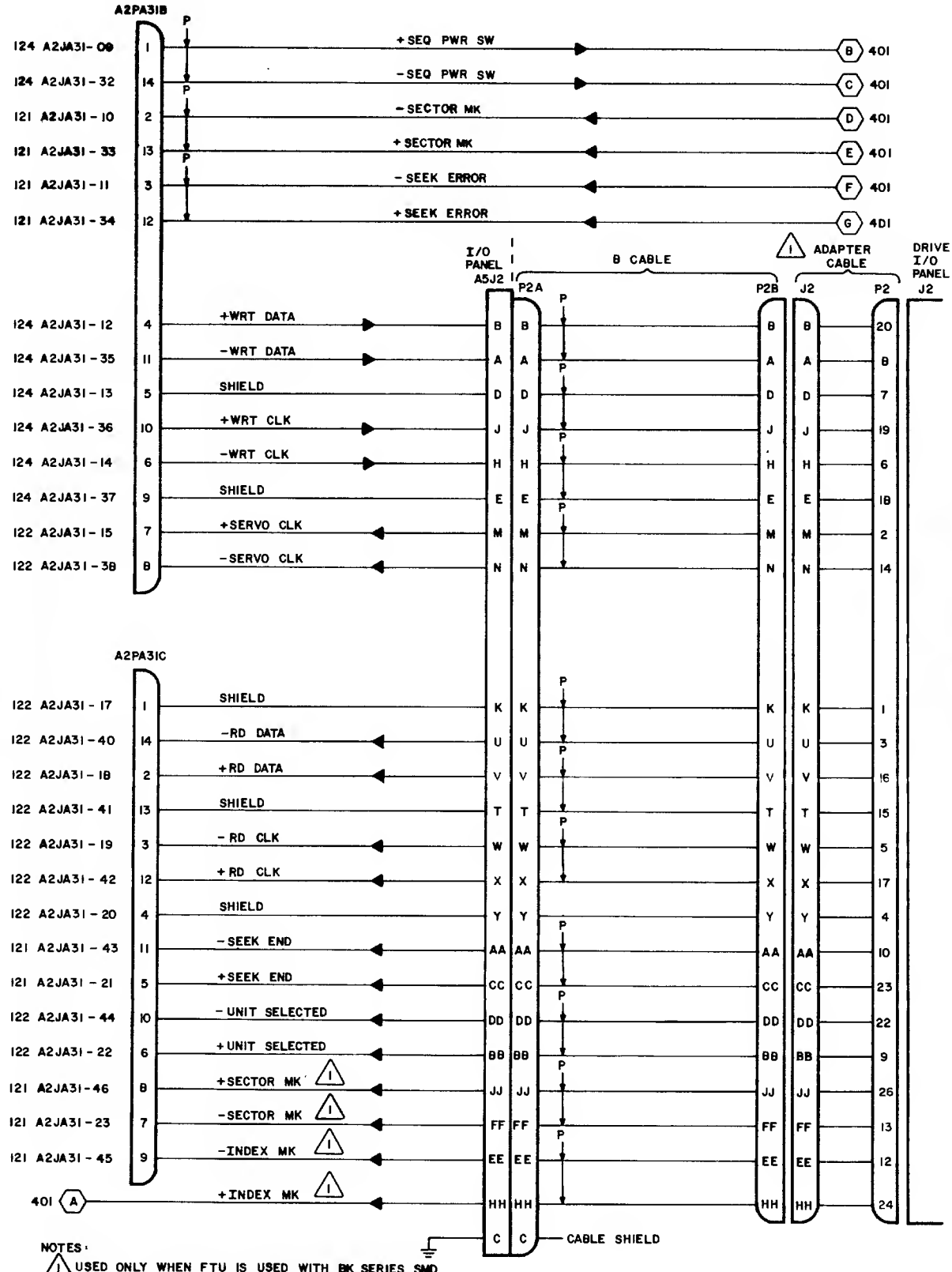
CONTROL DATA
NORMANDALE DIVISION

A-CABLE, CONNECTOR J3

TB304B/C

CODE IDENT 19333 | C | 83319600 | A
CROSS REF NO 401 | SHEET 41 | PAGE 5-41

CROSS REF NO 401



NOTES:

1. USED ONLY WHEN FTU IS USED WITH BK SERIES SMD UNITS. B-CABLE CONNECTOR P2B CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.

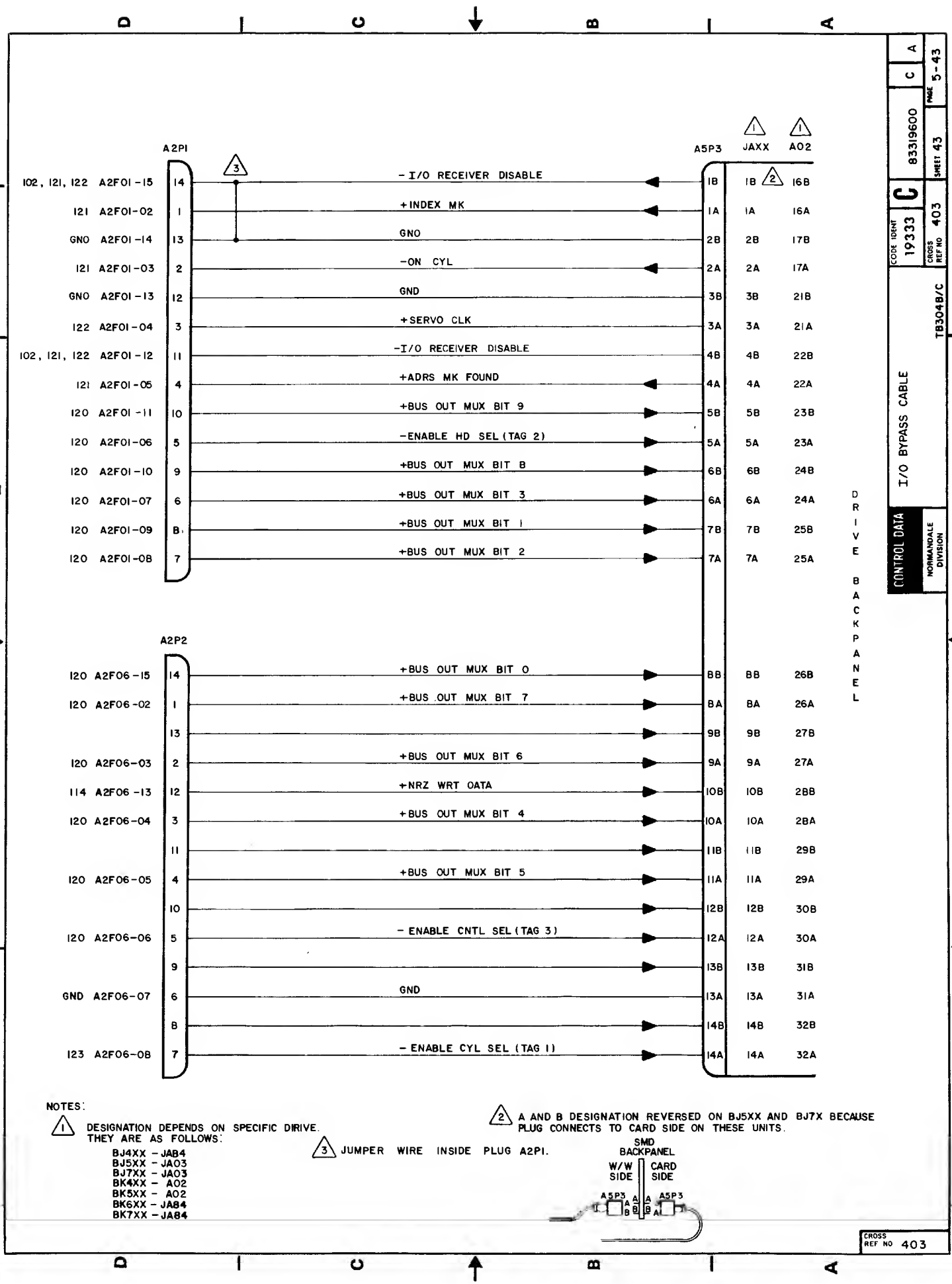
CONTROL DATA NORMANDALE DIVISION

B CABLE, CONNECTOR J2

TB3048/C

CODE IDENT 19333 | C | 83319600 | A

CROSS REF NO 402 | SHEET 42 | PAGE 5-42



NOTES:

1. DESIGNATION DEPENDS ON SPECIFIC DIRIVE. THEY ARE AS FOLLOWS:
   - BJ4XX - JAB4
   - BJ5XX - JA03
   - BJ7XX - JA03
   - BK4XX - A02
   - BK5XX - A02
   - BK6XX - JA84
   - BK7XX - JA84

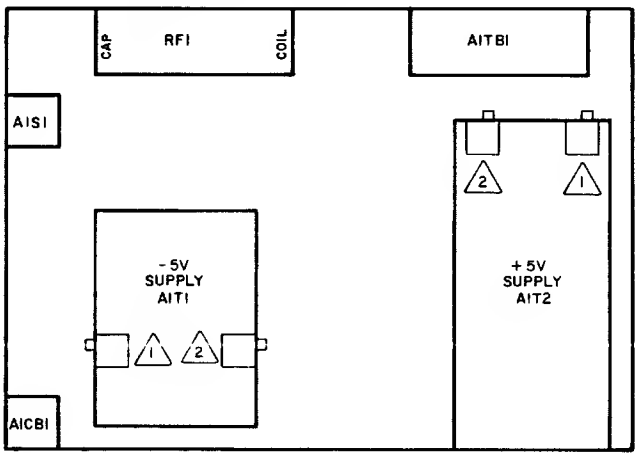
2. A AND B DESIGNATION REVERSED ON BJ5XX AND BJ7X BECAUSE PLUG CONNECTS TO CARD SIDE ON THESE UNITS.

3. JUMPER WIRE INSIDE PLUG A2P1.

CONTROL DATA
NORMANDALE DIVISION
I/O BYPASS CABLE
TB304B/C
CODE IDENT 19333
C
CROSS REF NO 403
83319600
SHEET 43
PAGE 5-43
A
C

CROSS REF NO 403

POWER SUPPLY
BASIC COMPONENT LAYOUT



NOTES:

1. VOLTAGE POT (SCREWDRIVER ADJ)
2. OVERVOLTAGE POT (SCREWDRIVER ADJ)

CONTROL DATA
NORMANDALE DIVISION

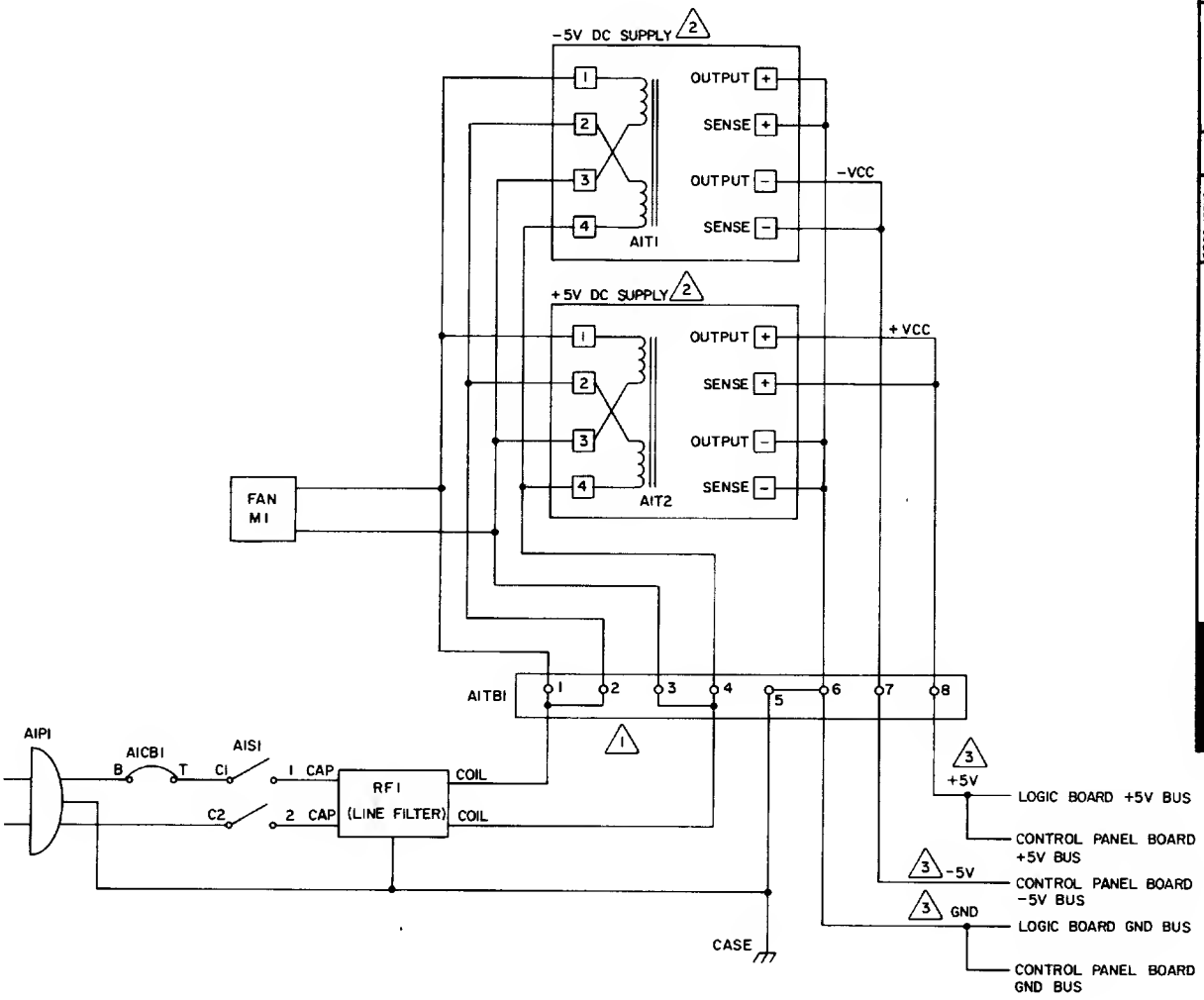
POWER SUPPLY LAYOUT

TB304B/C

CODE IDENT 19333 | C | 83319600 | D | B

CROSS REF NO 500 | SHEET 44 | PAGE 5-44

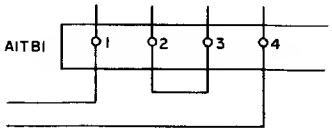
CROSS REF NO 500



NOTES:

1. WIRING SHOWN FOR 110V OPERATION

   FOR 220V OPERATION, JUMPER 1-2 AND 3-4 ARE REMOVED AND JUMPER 2-3 IS ADDED. THE RESULTANT IS SHOWN BELOW



2. THESE ARE REPLACED AS A UNIT AND THEREFORE INDIVIDUAL COMPONENTS (OTHER THAN TRANSFORMERS) ARE NOT SHOWN

3. REFER TO KEY TO LOGIC FOR +5V, -5V AND GND BUS CONNECTIONS

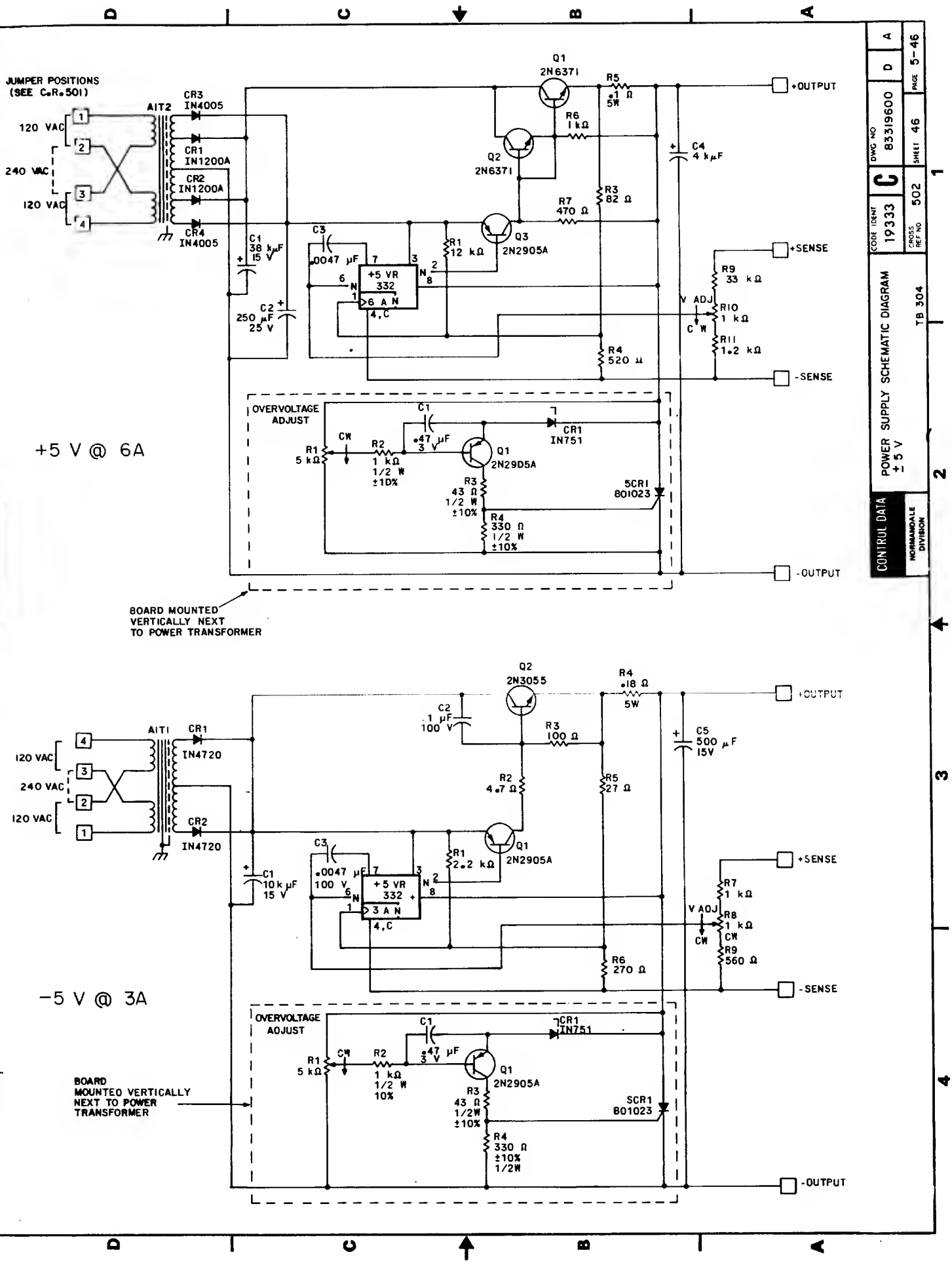
CONTROL DATA
NORMANDALE DIVISION

POWER SUPPLY WIRING DIAGRAM

TB304B/C

CODE IDENT 19333 | C | 83319600 | SHEET 45 | D | B | PAGE 5-45

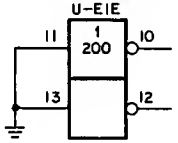
CROSS REF NO 501

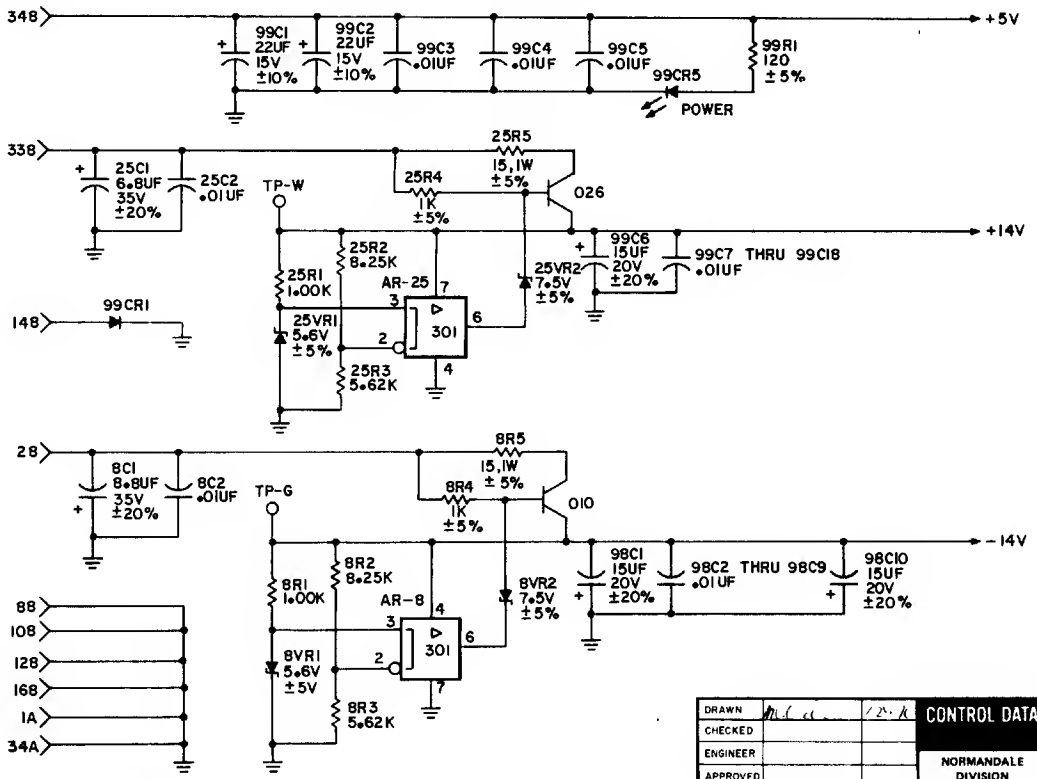

JUMPER POSITIONS
(SEE C.R. 501)
120 VAC
240 VAC
120 VAC
AIT2
CR3 IN4005
CR1 IN1200A
CR2 IN1200A
CR4 IN4005
C1 38 kμF 15 V
C2 250 μF 25 V
C3 .0047 μF
+5 VR 332
6 A N 4,C
Q1 2N6371
Q2 2N6371
Q3 2N2905A
R1 12 kΩ
R3 82 Ω
R4 520 Ω
R5 .1 Ω 5W
R6 1 kΩ
R7 470 Ω
C4 4 kμF
+OUTPUT
+SENSE
R9 33 kΩ
V ADJ
R10 1 kΩ
CW
R11 1.2 kΩ
-SENSE
-OUTPUT
+5 V @ 6A
OVERVOLTAGE ADJUST
C1 .47 μF 3 V
CR1 IN751
R1 5 kΩ
CW
R2 1 kΩ 1/2 W ±1D%
Q1 2N29D5A
R3 43 Ω 1/2 W ±10%
SCR1 801023
R4 330 Ω 1/2 W ±10%
BOARD MOUNTED VERTICALLY NEXT TO POWER TRANSFORMER
AIT1
CR1 IN4720
CR2 IN4720
120 VAC
240 VAC
120 VAC
C1 10 kμF 15 V
C2 .1 μF 100 V
C3 .0047 μF 100 V
+5 VR 332
3 A N 4,C
Q1 2N2905A
Q2 2N3055
R1 2.2 kΩ
R2 4.7 Ω
R3 100 Ω
R4 .18 Ω 5W
R5 27 Ω
R6 270 Ω
C5 500 μF 15V
+OUTPUT
+SENSE
R7 1 kΩ
V ADJ
R8 1 kΩ
CW
R9 560 Ω
-SENSE
-OUTPUT
-5 V @ 3A
OVERVOLTAGE ADJUST
C1 .47 μF 3 V
CR1 IN751
R1 5 kΩ
CW
R2 1 kΩ 1/2 W 10%
Q1 2N2905A
R3 43 Ω 1/2W ±10%
SCR1 801023
R4 330 Ω ±10% 1/2W
BOARD MOUNTED VERTICALLY NEXT TO POWER TRANSFORMER
CONTROL DATA
NORMANDALE DIVISION
POWER SUPPLY SCHEMATIC DIAGRAM ±5 V
TB 304
CODE IDENT 19333
C
DWG NO 8331600
SHEET 46
PAGE 5-46
CROSS REF NO 502
A
D

REVISION STATUS OF SHEETS																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	A	A	A																
B			B																

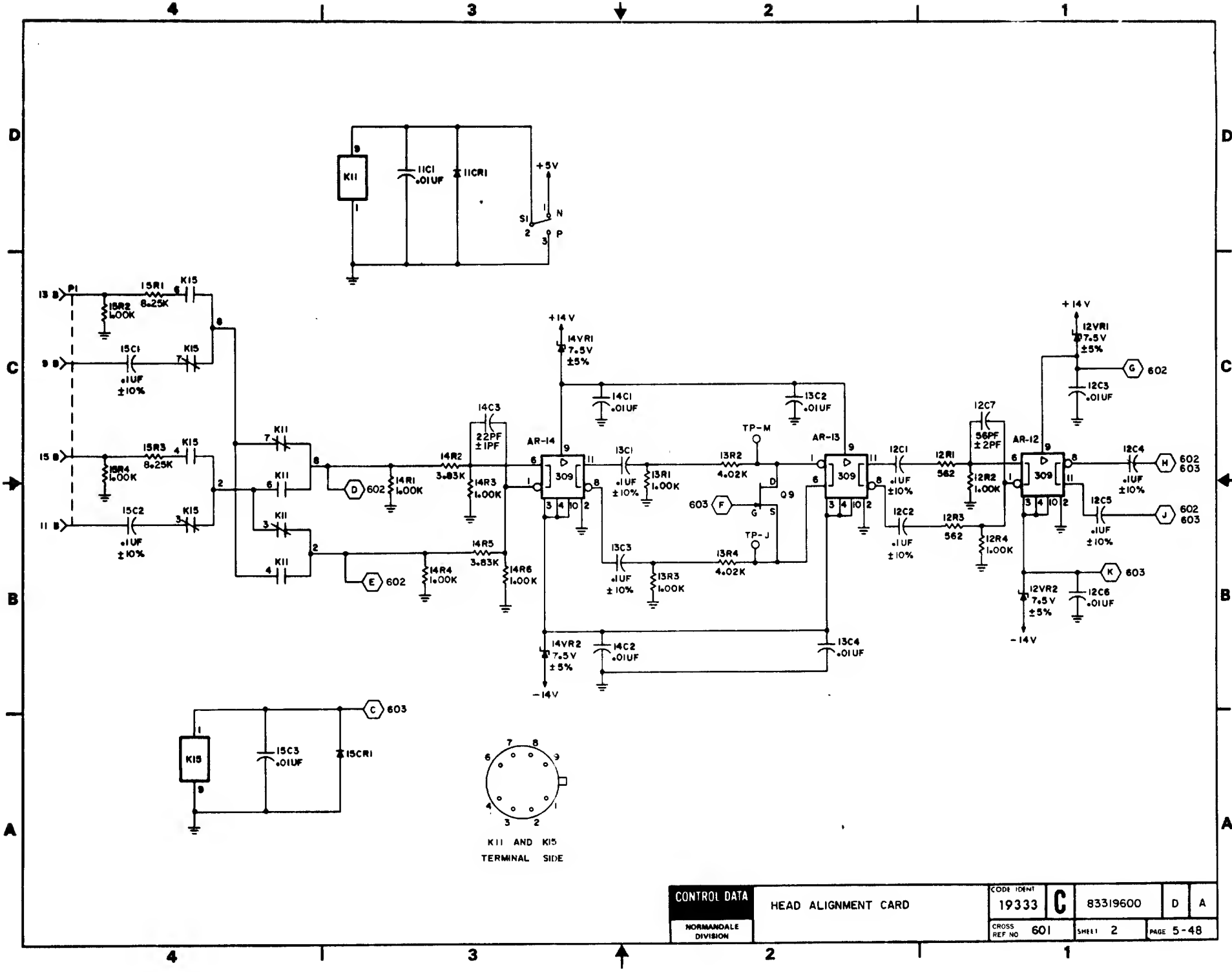
REVISIONS					
REV.	ECO.	DESCRIPTION	DRFT.	DATE	CHK'D
A	PE23000	RELEASED	MLA		
B		ADD NOTE TO SHT 4	MA	3-14-77	

SPARE GATES
U-E1E

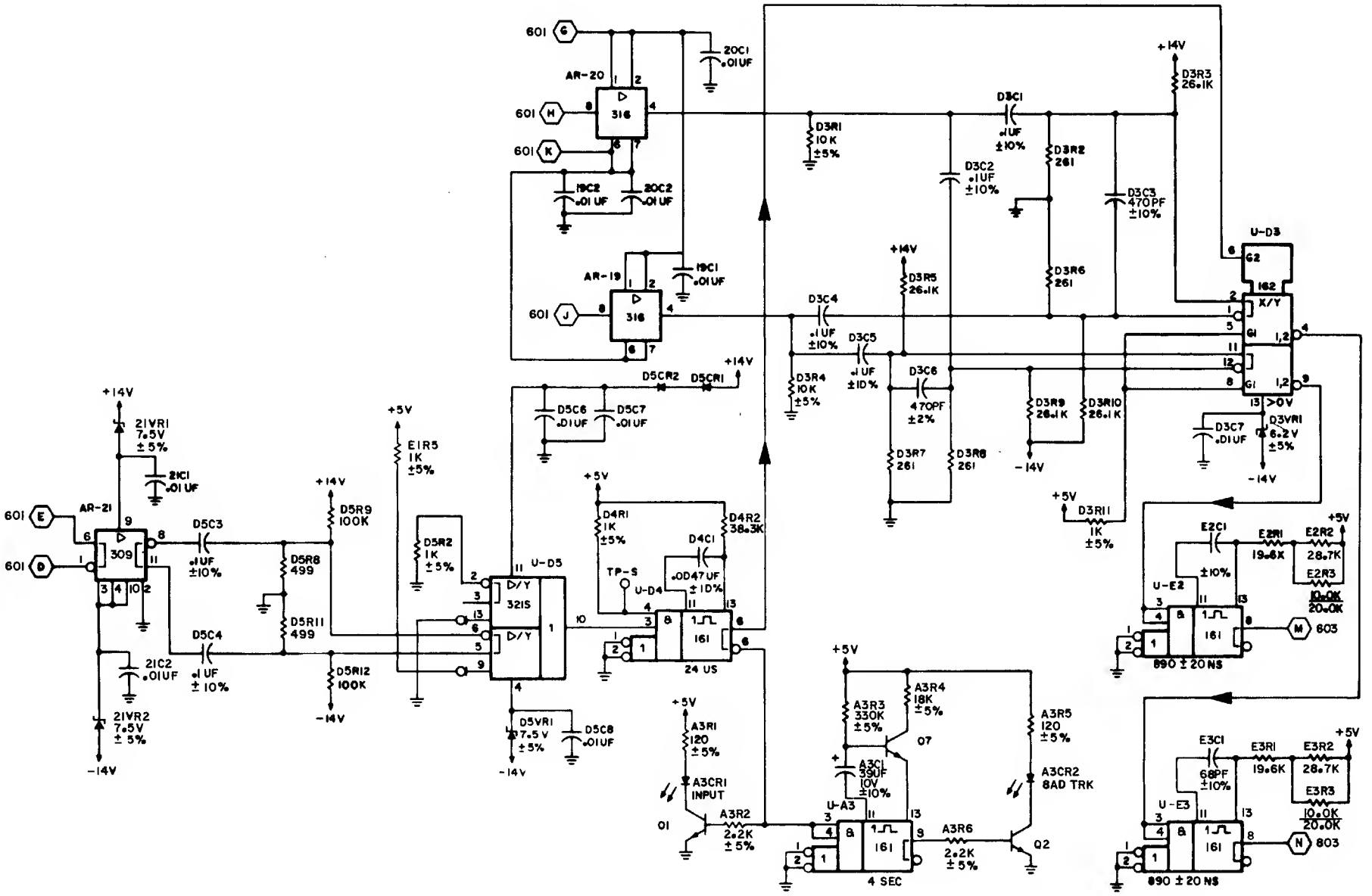




DRAWN		CONTROL DATA	HEAD ALIGNMENT CARD DIAGRAMS	CODE IDENT 19333	C	83319600	D B
CHECKED							
ENGINEER		NORMANDALE DIVISION	TYPE: HFSV	CROSS REF NO 600		SHEET 1 of 4	PAGE 5-47
APPROVED							



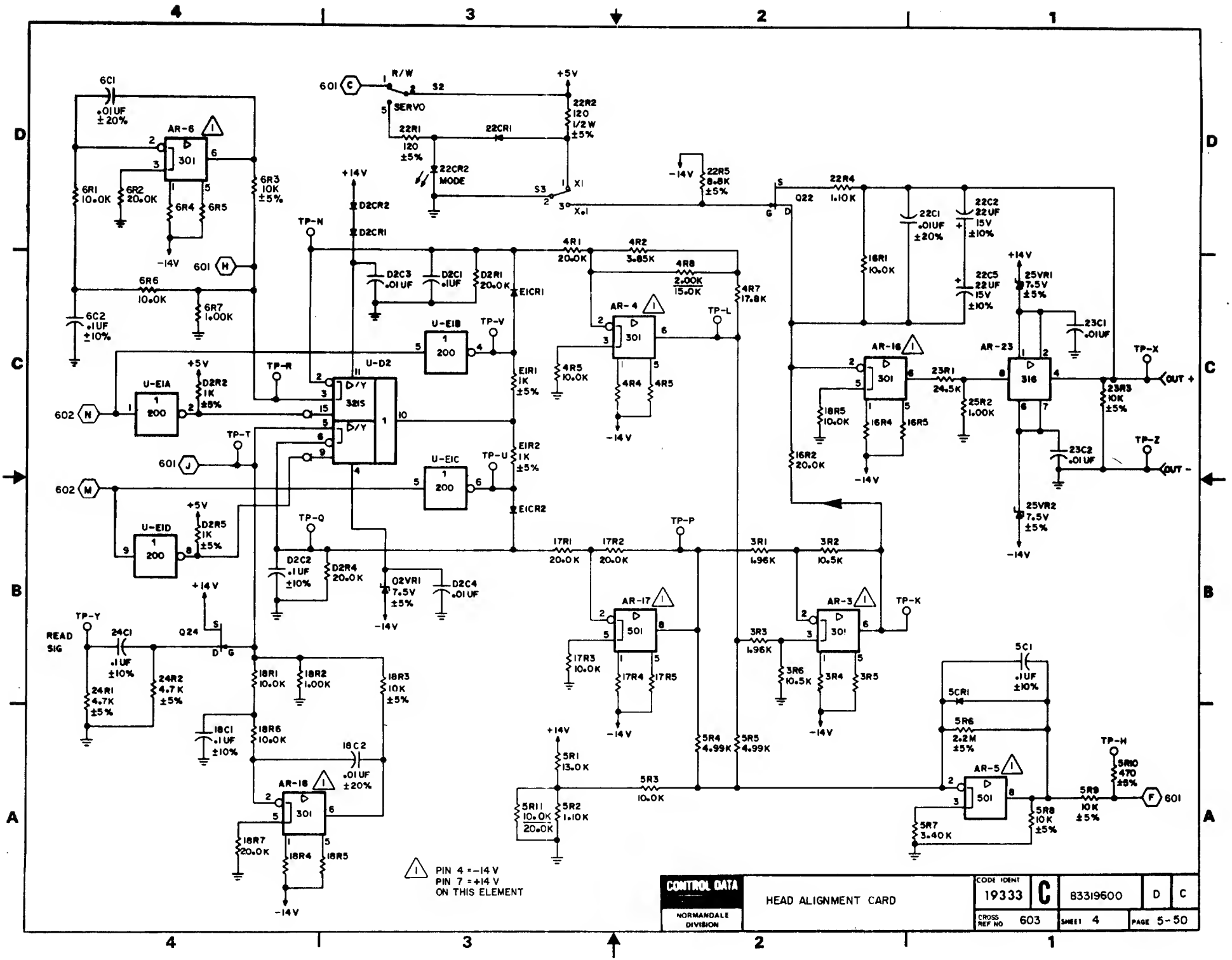
CONTROL DATA NORMANDALE DIVISION	HEAD ALIGNMENT CARD	CODE IDENT 19333	C	83319600	D	A
		CROSS REF NO 601		SHEET 2	PAGE 5-48	



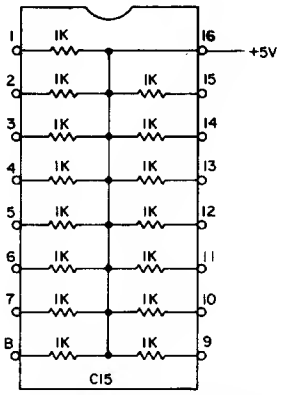
CONTROL DATA NORMANDALE DIVISION	HEAD ALIGNMENT CARD	CODE IDENT 19333	C	83319600	D A
		CROSS REF NO 602		SHEET 3	PAGE 5-49

TB304A

DIAGRAMS


6C1 .01UF ±20%
AR-6 301
6R1 10.0K
6R2 20.0K
6R3 10K ±5%
6R4
6R5
6R6 10.0K
6R7 1.00K
6C2 .1UF ±10%
-14V
601 H
601 C
R/W
32
SERVO
22R1 120 ±5%
22CR1
22CR2 MODE
+5V
22R2 120 1/2W ±5%
S3
X1
X.1
+14V
D2CR2
D2CR1
TP-N
D2C3 .01UF
D2C1 .1UF
D2R1 20.0K
EICR1
U-EIB 200
TP-V
EIR1 1K ±5%
U-D2 321S
TP-R
602 N
U-EIA 200
D2R2 1K ±5%
TP-T
601 J
602 M
U-EIC 200
TP-U
EIR2 1K ±5%
EICR2
U-EID 200
D2R5 1K ±5%
TP-Q
D2C2 .1UF ±10%
D2R4 20.0K
Q2VR1 7.5V ±5%
D2C4 .01UF
TP-P
17R1 20.0K
17R2 20.0K
AR-17 501
17R3 10.0K
17R4
17R5
3R1 1.96K
3R2 10.5K
AR-3 301
3R3 1.96K
3R6 10.5K
3R4
3R5
TP-K
READ SIG
TP-Y
24C1 .1UF ±10%
Q24
24R1 4.7K ±5%
24R2 4.7K ±5%
18R1 10.0K
18R2 1.00K
18R3 10K ±5%
18C1 .1UF ±10%
18R6 10.0K
18C2 .01UF ±20%
AR-18 301
18R7 20.0K
18R4
18R5
-14V
4R1 20.0K
4R2 3.65K
4R8 2.00K 15.0K
4R7 17.8K
TP-L
AR-4 301
4R5 10.0K
4R4
4R5
5R1 13.0K
5R11 10.0K 20.0K
5R2 1.10K
5R3 10.0K
5R4 4.99K
5R5 4.99K
-14V
22R5 8.8K ±5%
Q22
22R4 1.10K
22C1 .01UF ±20%
22C2 22UF 15V ±10%
16R1 10.0K
22C5 22UF 15V ±10%
AR-16 301
16R4
16R5
16R2 20.0K
23R1 24.5K
25R2 1.00K
AR-23 316
25VR1 7.5V ±5%
25VR2 7.5V ±5%
23C1 .01UF
23C2 .01UF
23R3 10K ±5%
TP-X
OUT +
TP-Z
OUT -
18R5 10.0K
5C1 .1UF ±10%
5CR1
5R6 2.2M ±5%
AR-5 501
5R7 3.40K
5R8 10K ±5%
5R9 10K ±5%
5R10 470 ±5%
TP-H
601 F
PIN 4 = -14 V
PIN 7 = +14 V
ON THIS ELEMENT
CONTROL DATA
NORMANDALE DIVISION
HEAD ALIGNMENT CARD
CODE IDENT 19333
C
83319600
D
C
CROSS REF NO 603
SHEET 4
PAGE 5-50

HEADER CHIP CONNECTORS

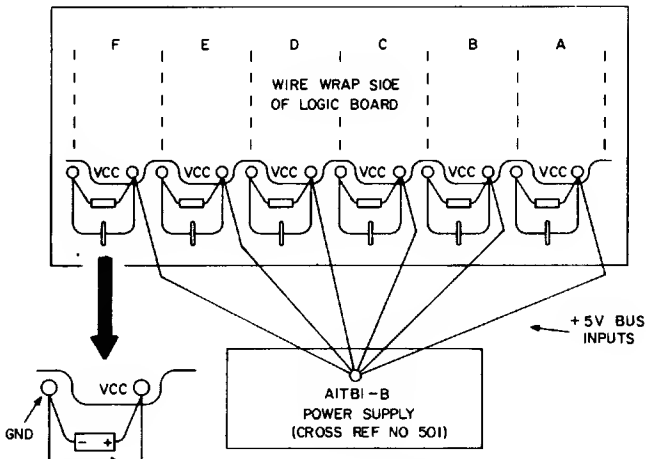


ALL IK RESISTORS FOUND IN THESE DIAGRAMS ARE LOCATED ON THIS HEADER CHIP (UNLESS OTHERWISE SPECIFIED) WHICH IK RESISTOR IS BEING REFERRED IS DETERMINED BY TRACING THE WIREWRAP CONNECTIONS (VIA THE LOGIC WIRELIST) BACK TO THIS HEADER CHIP

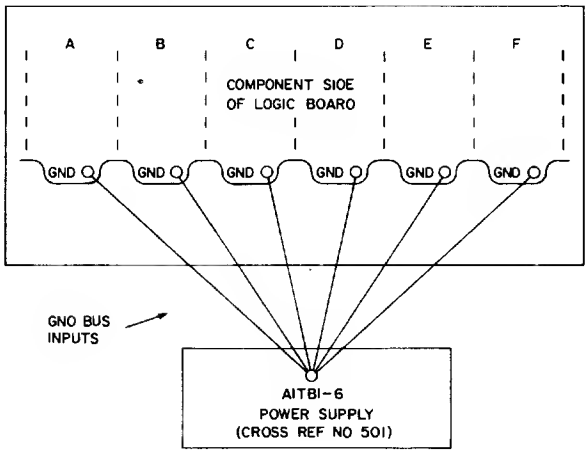
NOTES

1 THE FOLLOWING SHEETS ARE THE LOGICAL DIAGRAMS FOR THE LOGIC (WIREWRAP) BOARD

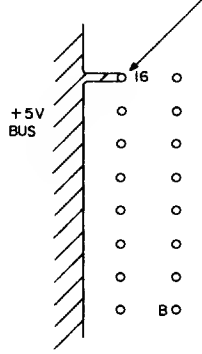
POWER CONNECTIONS



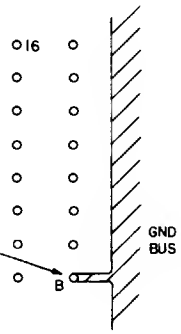
GROUND CONNECTIONS



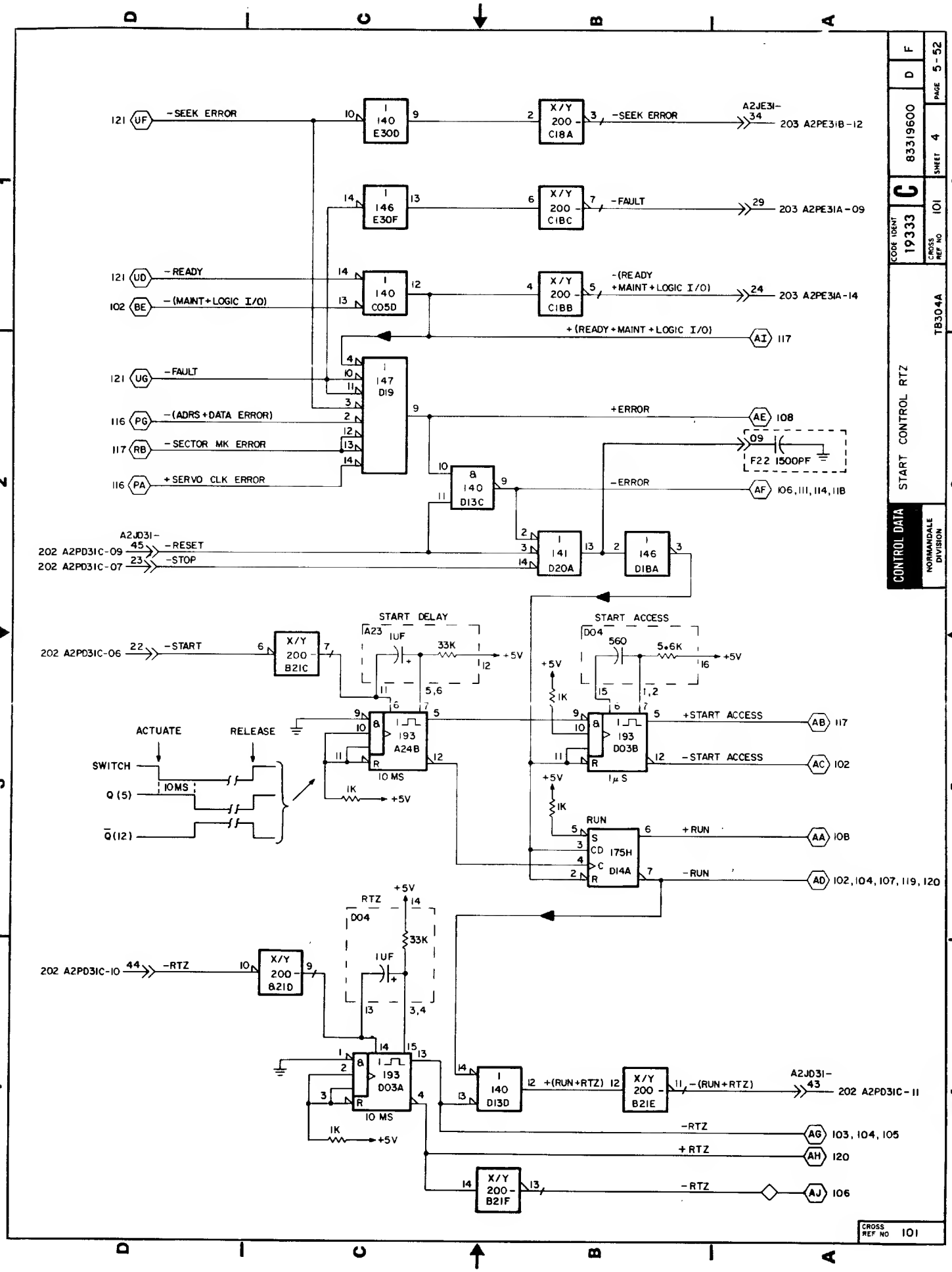
PIN 16 OF EACH CHIP LOCATION CONNECTS TO +5V BUS EXCEPT AT CHIP LOCATIONS A01, A02, A03, A04, A06, AND A20

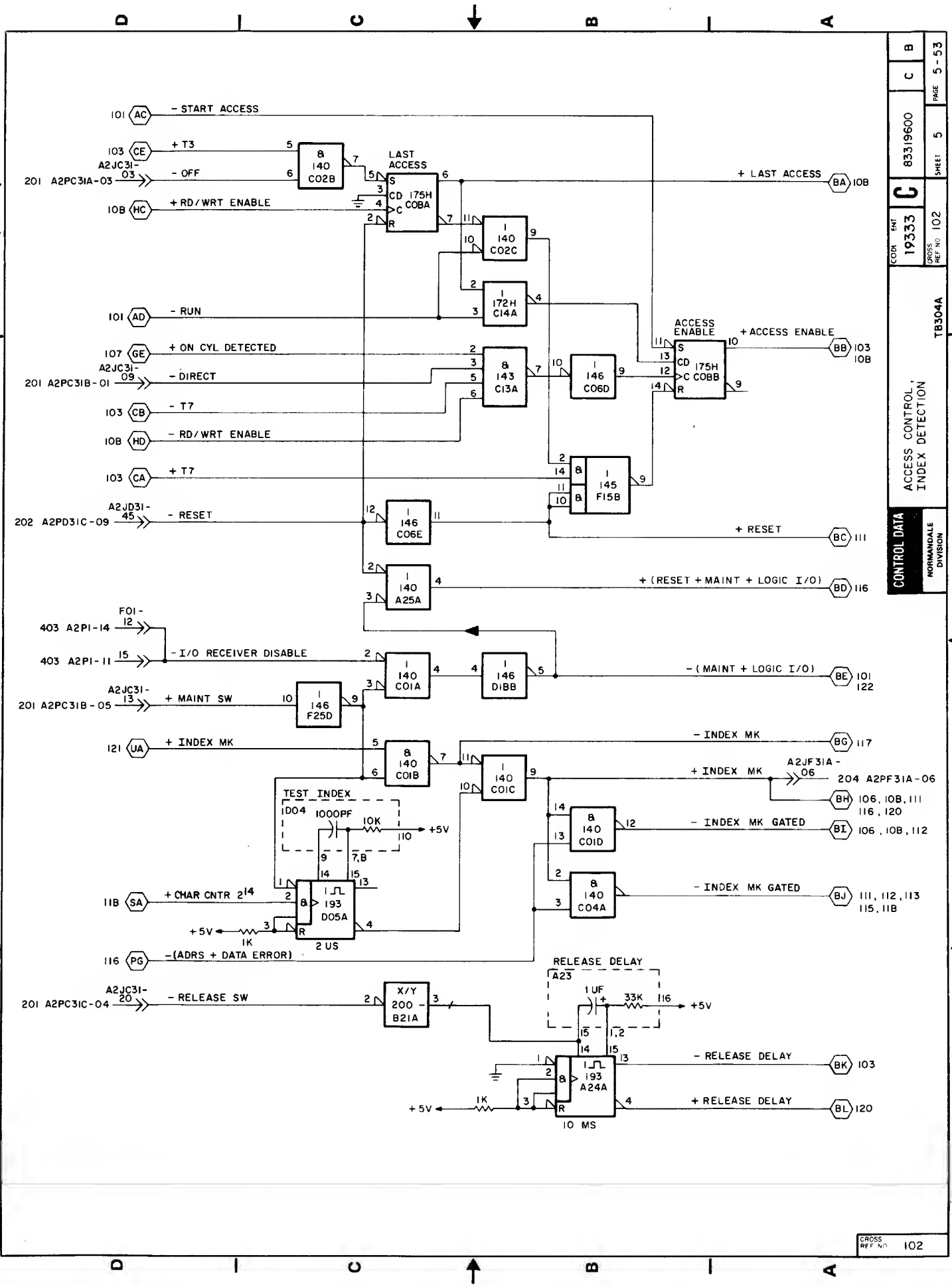


PIN B OF EACH CHIP LOCATION CONNECTS TO GND BUS EXCEPT AT CHIP LOCATIONS A01, A02, A03, A04, A19, D04, F01, AND F06



CONTROL DATA NORMANDALE DIVISION
LOGIC BOARD
TB3044A
CODE IDENT 19333
C
83319600
SHEET 3
PAGE 5-51
CROSS REF NO 100


121 UF -SEEK ERROR
I 140 E30D
X/Y 200 - C18A
-SEEK ERROR
A2JE31- 34
203 A2PE31B-12
I 146 E30F
X/Y 200 - C18C
-FAULT
29
203 A2PE31A-09
121 UD -READY
102 BE -(MAINT+LOGIC I/O)
I 140 C05D
X/Y 200 - C18B
-(READY +MAINT+LOGIC I/O)
24
203 A2PE31A-14
+(READY+MAINT+LOGIC I/O)
AI 117
121 UG -FAULT
116 PG -(ADRS+DATA ERROR)
117 RB -SECTOR MK ERROR
116 PA +SERVO CLK ERROR
I 147 D19
+ERROR
AE 108
09
F22 1500PF
8 140 D13C
-ERROR
AF 106,111,114,118
A2JD31-
202 A2PD31C-09 45 -RESET
202 A2PD31C-07 23 -STOP
I 141 D20A
I 146 D18A
START DELAY
A23
1UF
33K
+5V
START ACCESS
D04
560
5.6K
202 A2PD31C-06 22 -START
X/Y 200 - B21C
ACTUATE
RELEASE
SWITCH
10MS
Q (5)
$\overline{Q}$(12)
I 193 A24B
10 MS
1K
I 193 D03B
1μS
+START ACCESS
AB 117
-START ACCESS
AC 102
RUN
S CD 175H C R D14A
+RUN
AA 108
-RUN
AD 102,104,107,119,120
RTZ
D04
33K
1UF
202 A2PD31C-10 44 -RTZ
X/Y 200 - B21D
I 193 D03A
I 140 D13D
+(RUN+RTZ)
X/Y 200 - B21E
-(RUN+RTZ)
A2JD31- 43
202 A2PD31C-11
-RTZ
AG 103,104,105
+RTZ
AH 120
X/Y 200 - B21F
-RTZ
AJ 106
CONTROL DATA
NORMANDALE DIVISION
START CONTROL RTZ
TB304A
CODE IDENT 19333
C
83319600
D
F
SHEET 4
PAGE 5-52
CROSS REF NO 101



CONTROL DATA NORMANDALE DIVISION

ACCESS CONTROL, INDEX DETECTION

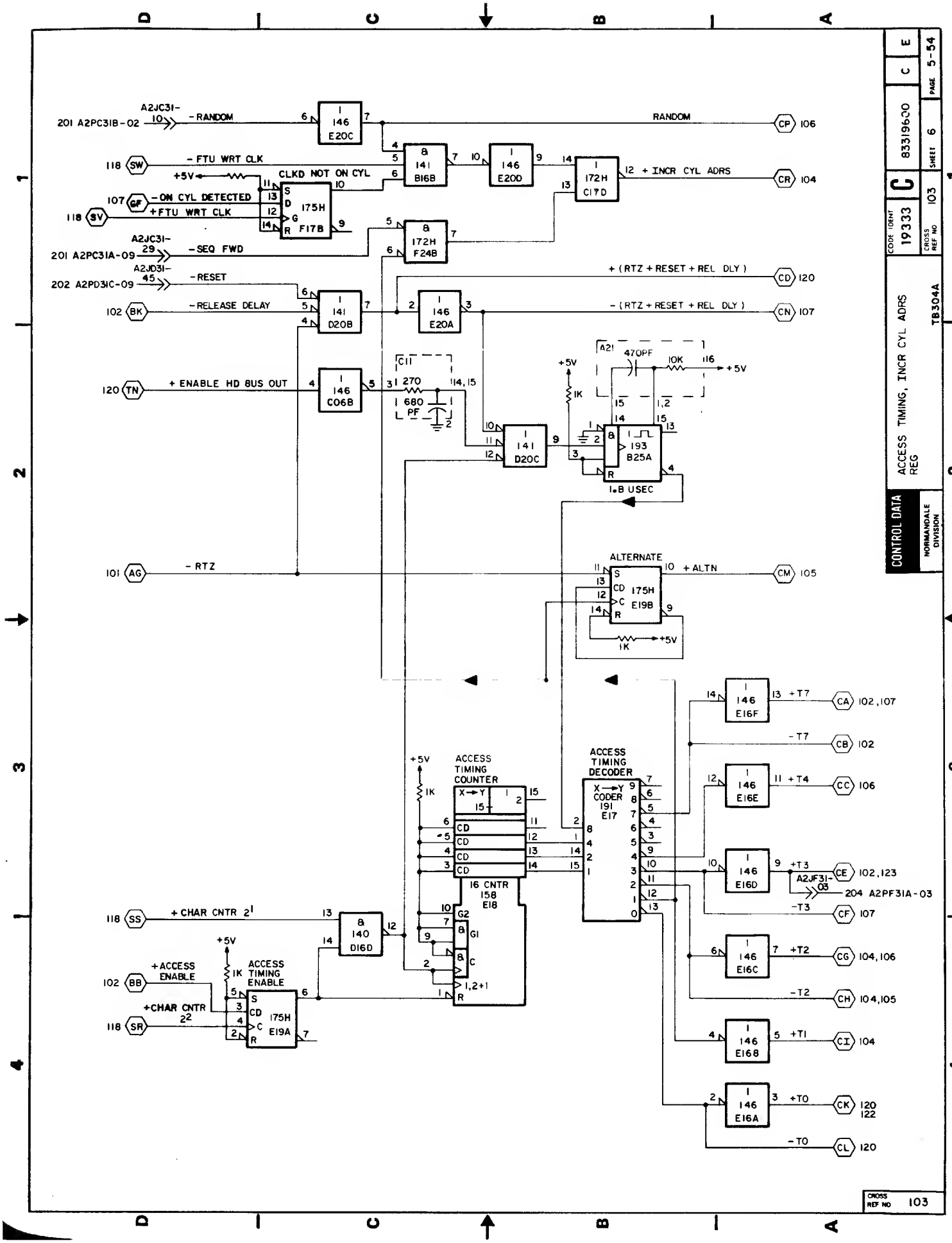
TB304A

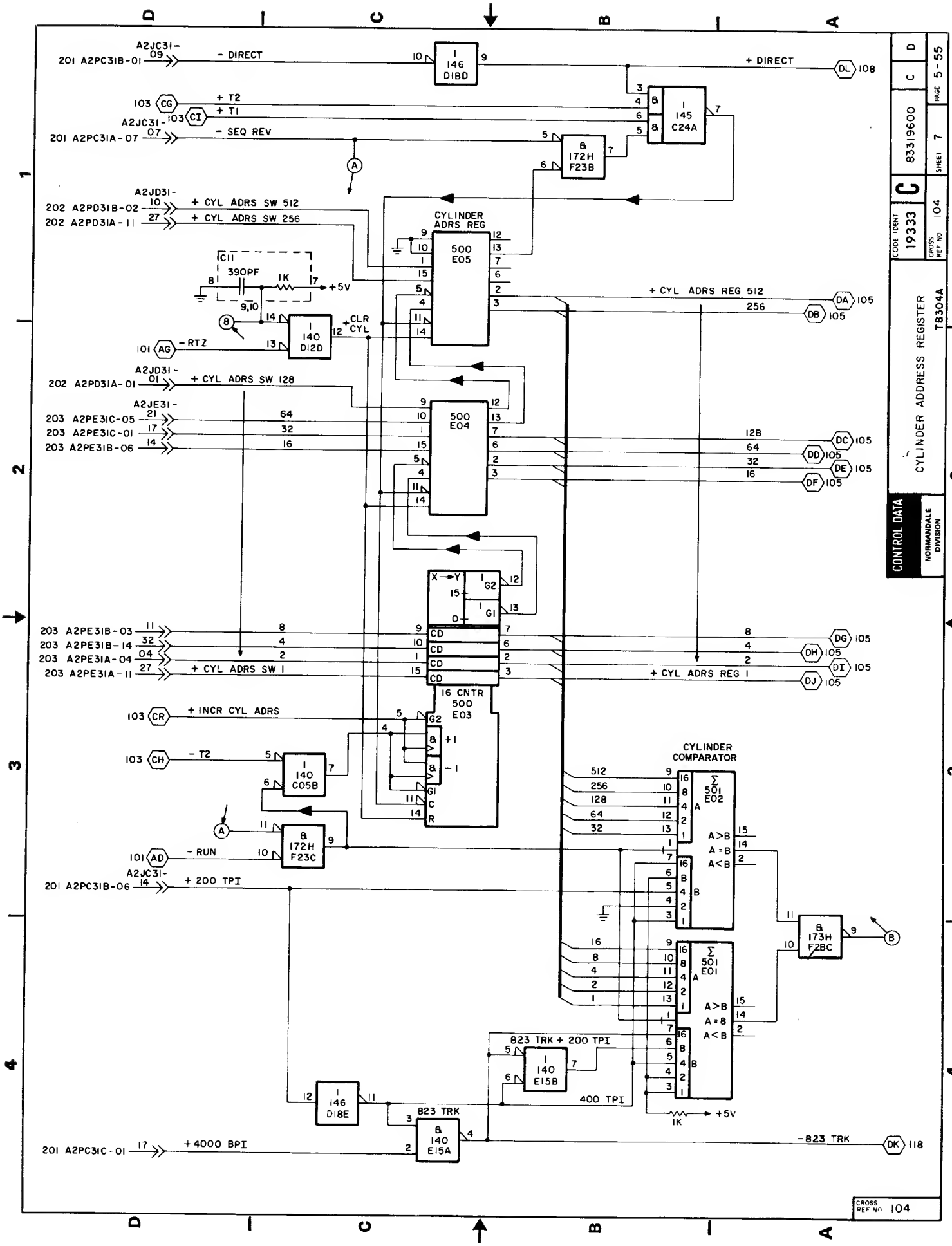
CODE ENT 19333 C

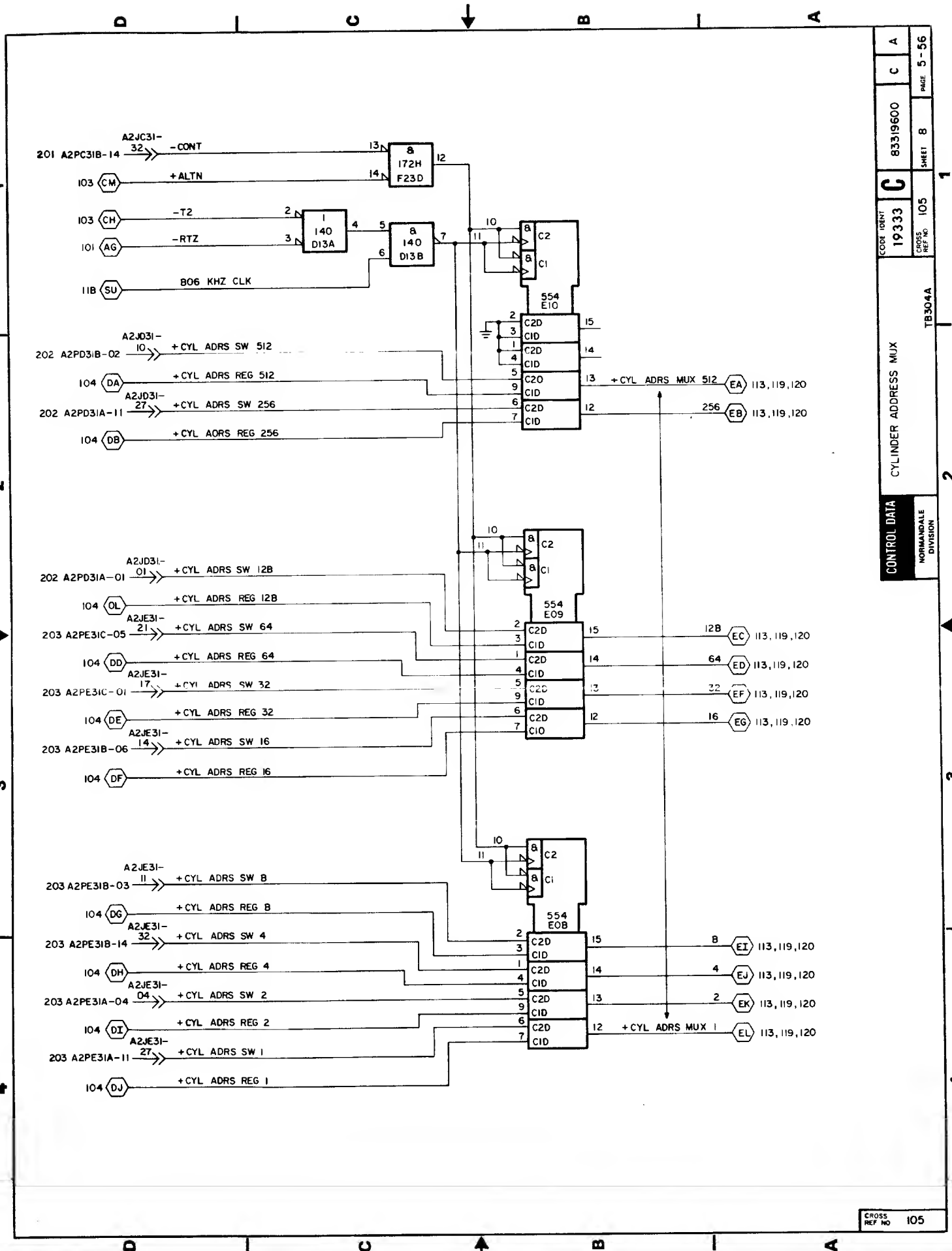
CROSS REF NO 102

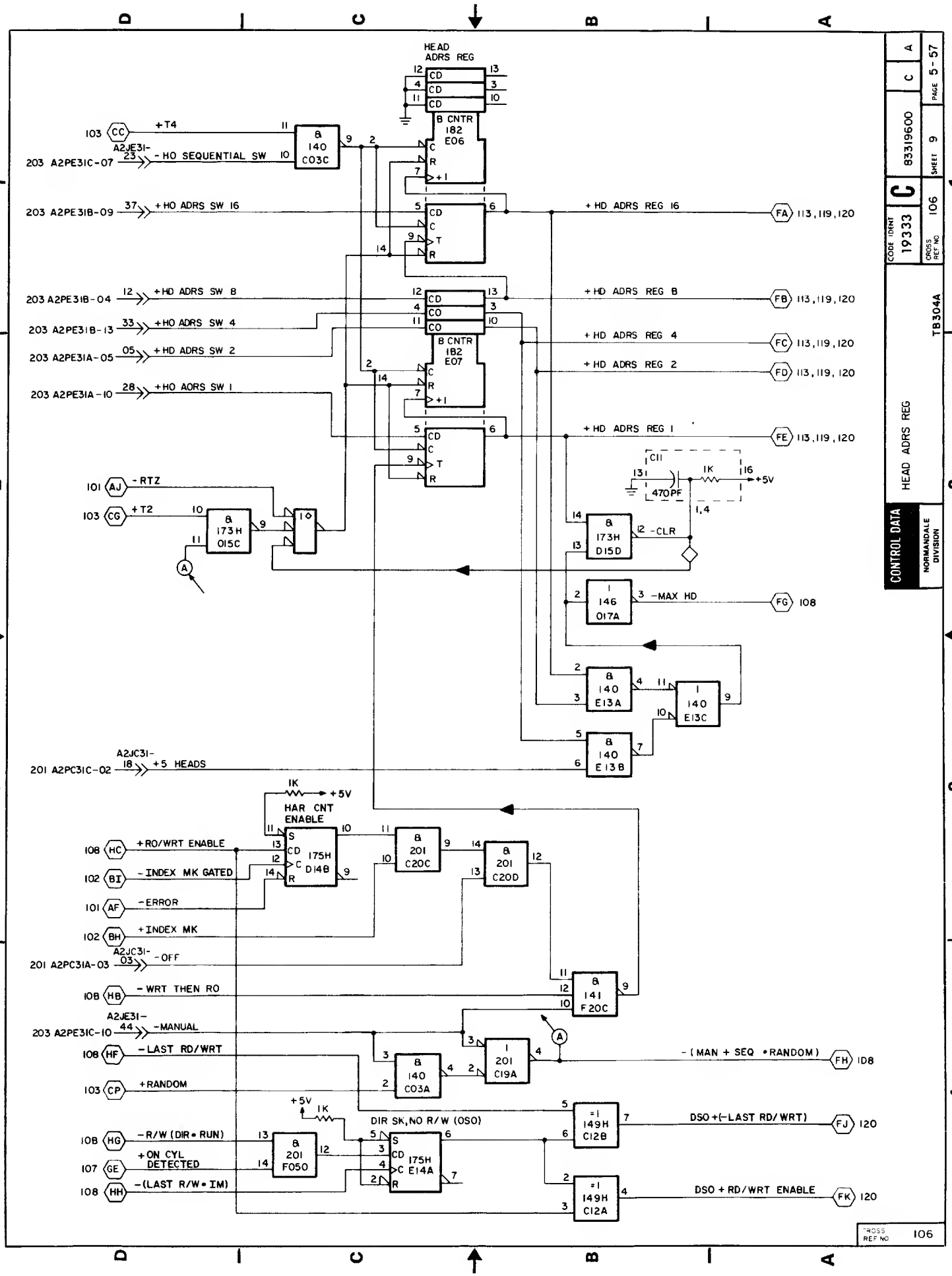
83319600 SHEET 5 PAGE 5-53 B C

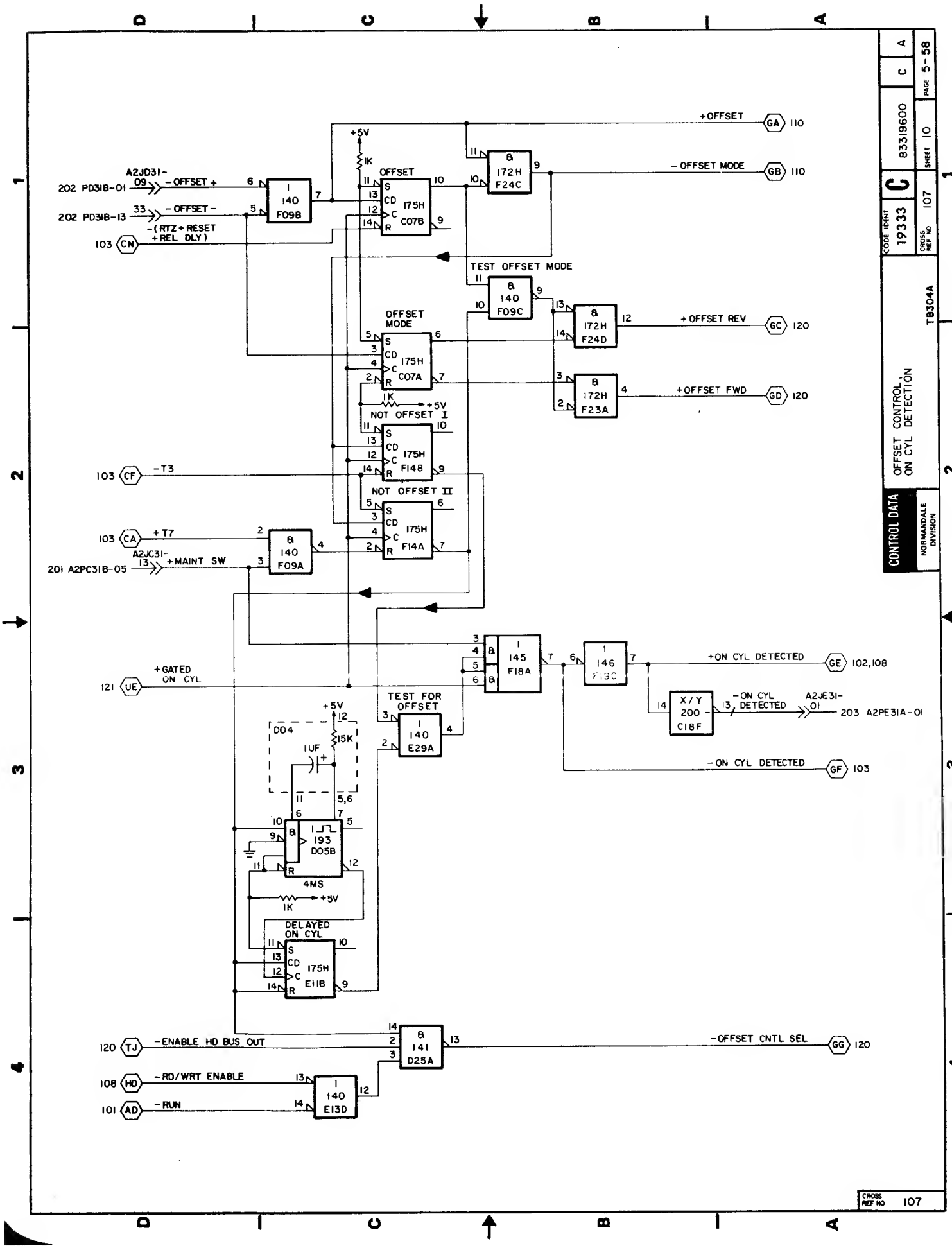
CROSS REF NO 102

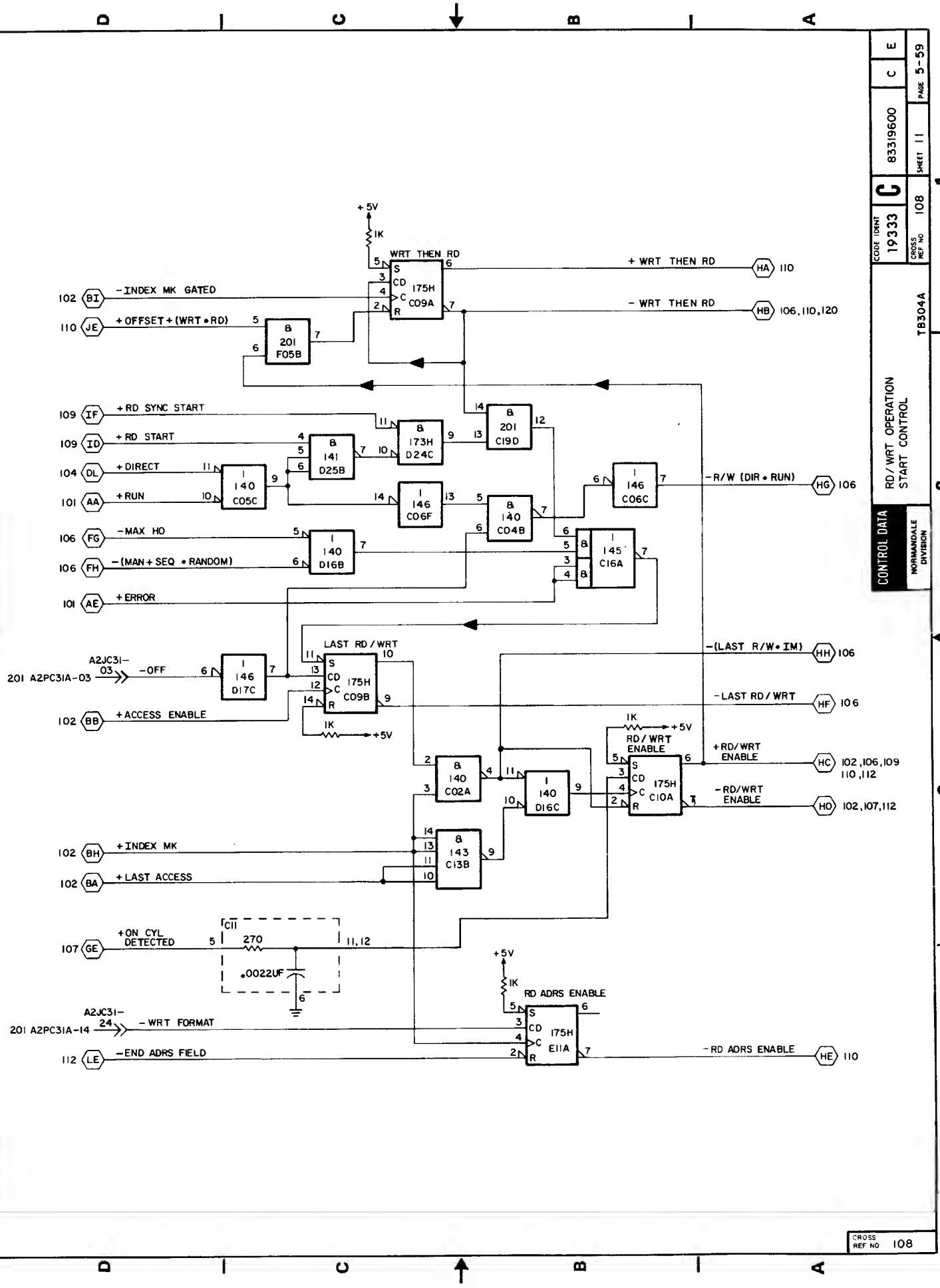

A2JC31-
10
201 A2PC31B-02
-RANDOM
1 146 E20C
RANDOM
CP 106
118 SW
-FTU WRT CLK
+5V
CLKD NOT ON CYL
8 141 B16B
1 146 E20D
1 172H C17D
+INCR CYL ADRS
CR 104
107 GF
-ON CYL DETECTED
118 SV
+FTU WRT CLK
175H F17B
A2JC31-
29
201 A2PC31A-09
-SEQ FWD
8 172H F24B
A2JD31-
45
202 A2PD31C-09
-RESET
+(RTZ+RESET+REL DLY)
CD 120
102 BK
-RELEASE DELAY
1 141 D20B
1 146 E20A
-(RTZ+RESET+REL DLY)
CN 107
C11
270
680 PF
A21
470PF
10K
+5V
1K
120 TN
+ENABLE HD BUS OUT
1 146 C06B
1 141 D20C
1 193 B25A
1.8 USEC
101 AG
-RTZ
ALTERNATE
+ALTN
CM 105
175H E19B
1K
+5V
ACCESS TIMING COUNTER
X→Y CODER 191 E17
ACCESS TIMING DECODER
16 CNTR 158 E18
1 146 E16F
+T7
CA 102,107
-T7
CB 102
1 146 E16E
+T4
CC 106
1 146 E16D
+T3
CE 102,123
A2JF31-03
204 A2PF31A-03
-T3
CF 107
1 146 E16C
+T2
CG 104,106
-T2
CH 104,105
1 146 E16B
+T1
CI 104
1 146 E16A
+T0
CK 120 122
-T0
CL 120
118 SS
+CHAR CNTR 2^1
8 140 D16D
102 BB
+ACCESS ENABLE
ACCESS TIMING ENABLE
118 SR
+CHAR CNTR 2^2
175H E19A
CONTROL DATA
NORMANDALE DIVISION
ACCESS TIMING, INCR CYL ADRS REG
TB304A
CODE IDENT 19333
CROSS REF NO 103
C
83319630
SHEET 6
PAGE 5-54
CROSS REF NO 103

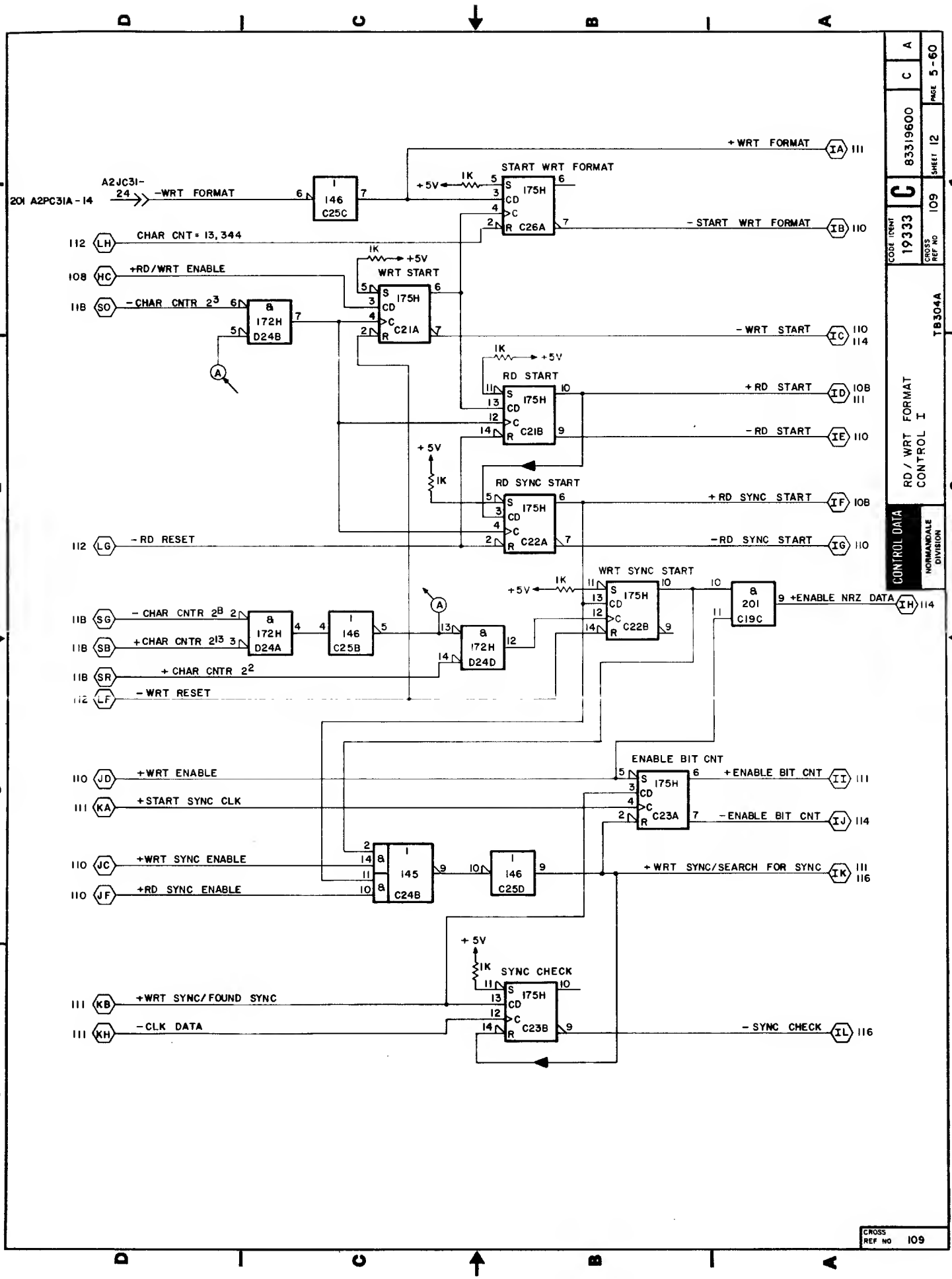

CONTROL DATA
NORMANDALE DIVISION
CYLINDER ADDRESS REGISTER
T8304A
CODE IDENT 19333
CROSS REF NO 104
83319600
SHEET 7
PAGE 5-55
- DIRECT
+ DIRECT
+ T2
+ T1
- SEQ REV
+ CYL ADRS SW 512
+ CYL ADRS SW 256
+ CYL ADRS SW 128
+ CYL ADRS SW 1
CYLINDER ADRS REG
+ CYL ADRS REG 512
256
128
64
32
16
8
4
2
+ CYL ADRS REG 1
390PF
1K
+5V
+CLR CYL
- RTZ
16 CNTR
+ INCR CYL ADRS
- T2
- RUN
+ 200 TPI
CYLINDER COMPARATOR
A>B
A=B
A<B
823 TRK + 200 TPI
400 TPI
823 TRK
-823 TRK
+4000 BPI
CROSS REF NO 104

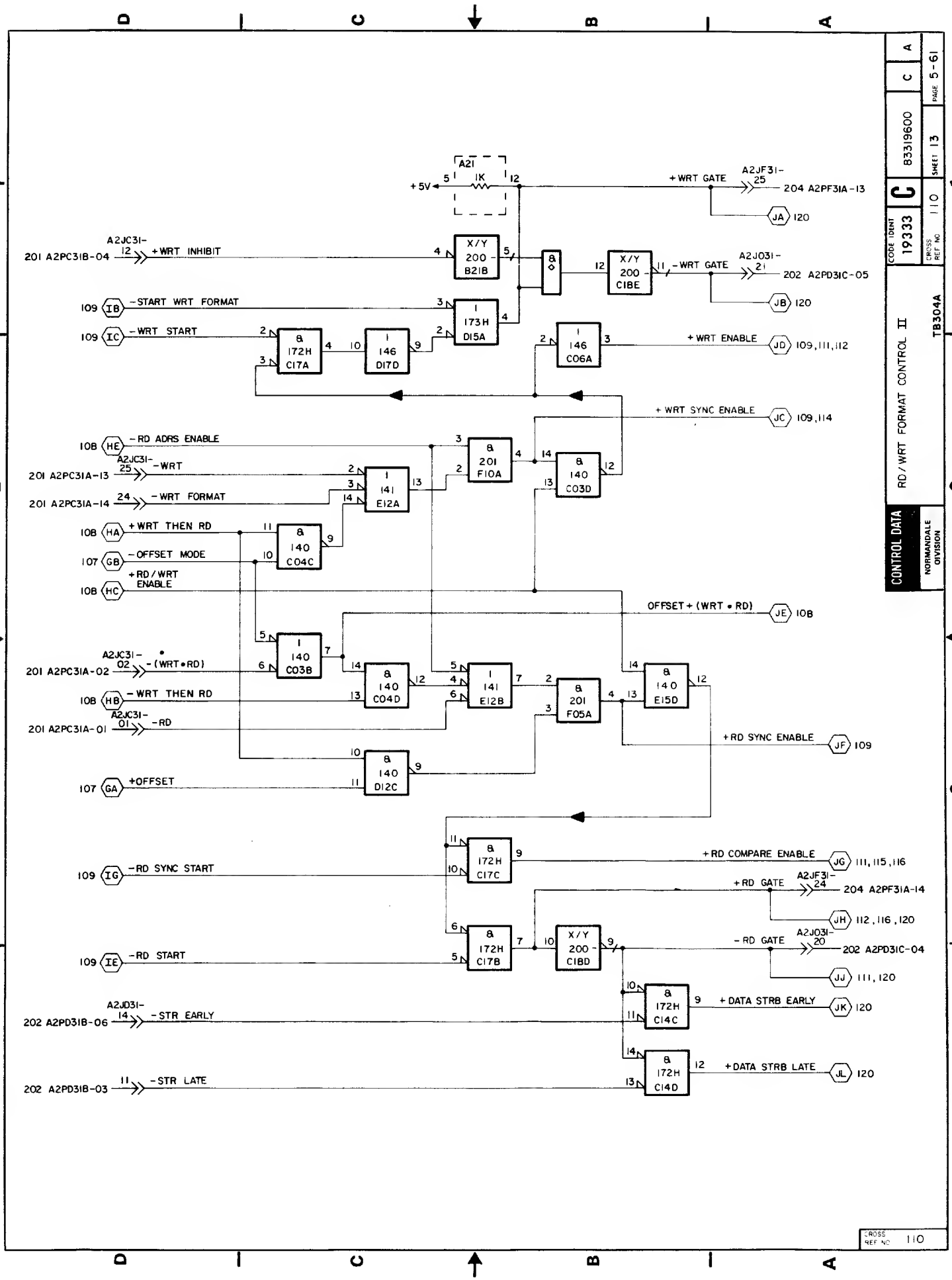

A2JC31-
32
201 A2PC31B-14
-CONT
103 CM
+ALTN
8
172H
F23D
103 CH
-T2
101 AG
-RTZ
1
140
D13A
8
140
D13B
11B SU
806 KHZ CLK
554
E10
A2JD31-
10
202 A2PD31B-02
+CYL ADRS SW 512
104 DA
+CYL ADRS REG 512
A2JD31-
27
202 A2PD31A-11
+CYL ADRS SW 256
104 DB
+CYL AORS REG 256
+CYL ADRS MUX 512
EA 113,119,120
256
EB 113,119,120
554
E09
A2JD31-
01
202 A2PD31A-01
+CYL ADRS SW 128
104 OL
+CYL ADRS REG 128
A2JE31-
21
203 A2PE31C-05
+CYL ADRS SW 64
104 DD
+CYL ADRS REG 64
A2JE31-
17
203 A2PE31C-01
+CYL ADRS SW 32
104 DE
+CYL ADRS REG 32
A2JE31-
14
203 A2PE31B-06
+CYL ADRS SW 16
104 DF
+CYL ADRS REG 16
128
EC 113,119,120
64
ED 113,119,120
32
EF 113,119,120
16
EG 113,119,120
554
E08
A2JE31-
11
203 A2PE31B-03
+CYL ADRS SW 8
104 DG
+CYL ADRS REG 8
A2JE31-
32
203 A2PE31B-14
+CYL ADRS SW 4
104 DH
+CYL ADRS REG 4
A2JE31-
04
203 A2PE31A-04
+CYL ADRS SW 2
104 DI
+CYL ADRS REG 2
A2JE31-
27
203 A2PE31A-11
+CYL ADRS SW 1
104 DJ
+CYL ADRS REG 1
+CYL ADRS MUX 1
8 EI 113,119,120
4 EJ 113,119,120
2 EK 113,119,120
EL 113,119,120
CONTROL DATA
NORMANDALE DIVISION
CYLINDER ADDRESS MUX
TB304A
CODE IDENT 19333
C
83319600
SHEET 8
PAGE 5-56
CROSS REF NO 105
CROSS REF NO 105

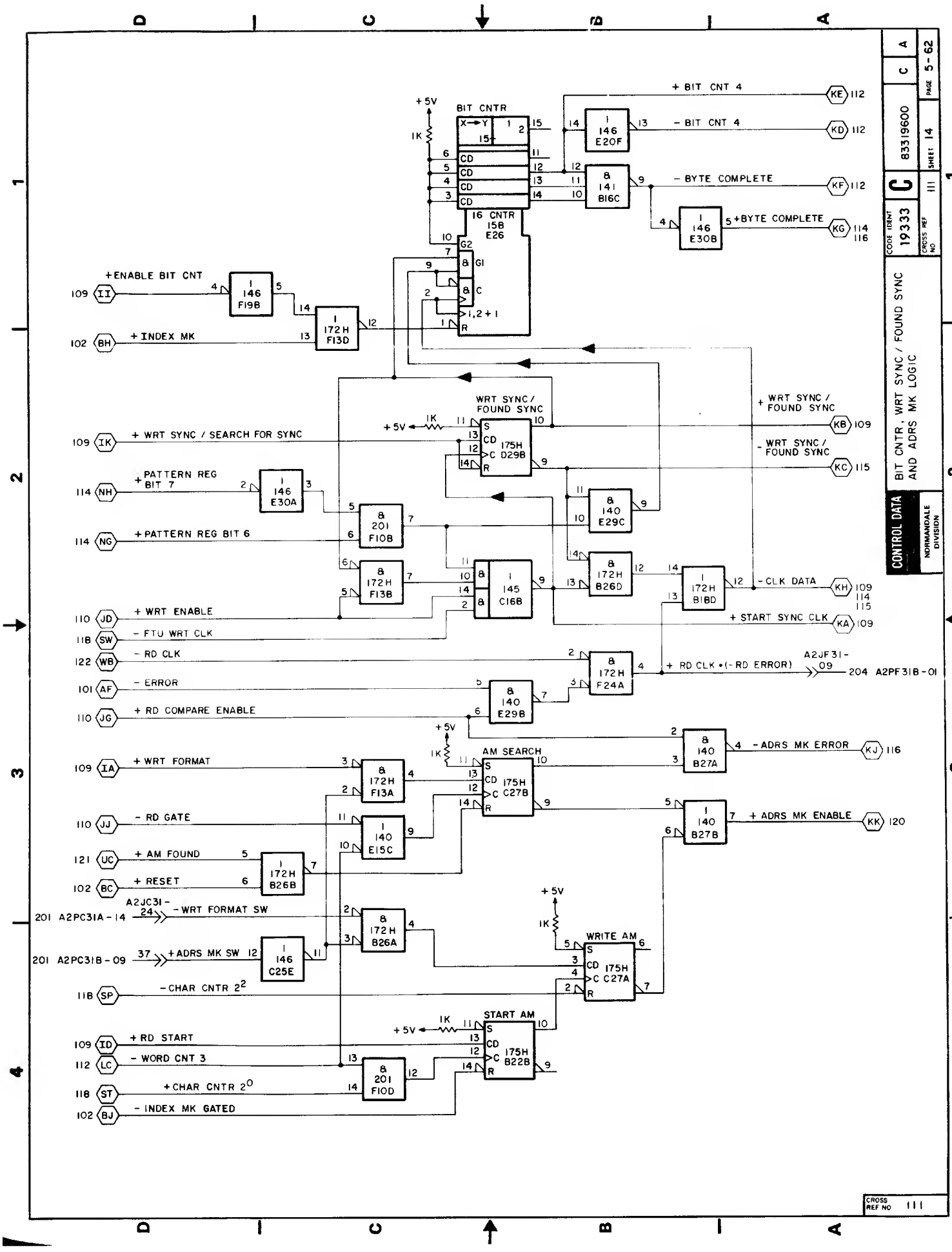

HEAD ADRS REG
B CNTR 182 E06
B CNTR 182 E07
+T4
- HO SEQUENTIAL SW
+HO ADRS SW 16
+HO ADRS SW 8
+HO ADRS SW 4
+HO ADRS SW 2
+HO AORS SW 1
+HD ADRS REG 16
+HD ADRS REG 8
+HD ADRS REG 4
+HD ADRS REG 2
+HD ADRS REG 1
-RTZ
+T2
-CLR
-MAX HD
+5 HEADS
HAR CNT ENABLE
+RO/WRT ENABLE
-INDEX MK GATED
-ERROR
+INDEX MK
-OFF
-WRT THEN RO
-MANUAL
-LAST RD/WRT
+RANDOM
-R/W (DIR • RUN)
+ON CYL DETECTED
-(LAST R/W • IM)
DIR SK, NO R/W (OSO)
-(MAN + SEQ • RANDOM)
DSO + (-LAST RD/WRT)
DSO + RD/WRT ENABLE
470PF
1K
+5V
CONTROL DATA
NORMANDALE DIVISION
HEAD ADRS REG
TB304A
CODE IDENT 19333
C
83319600
SHEET 9
PAGE 5-57
CROSS REF NO 106

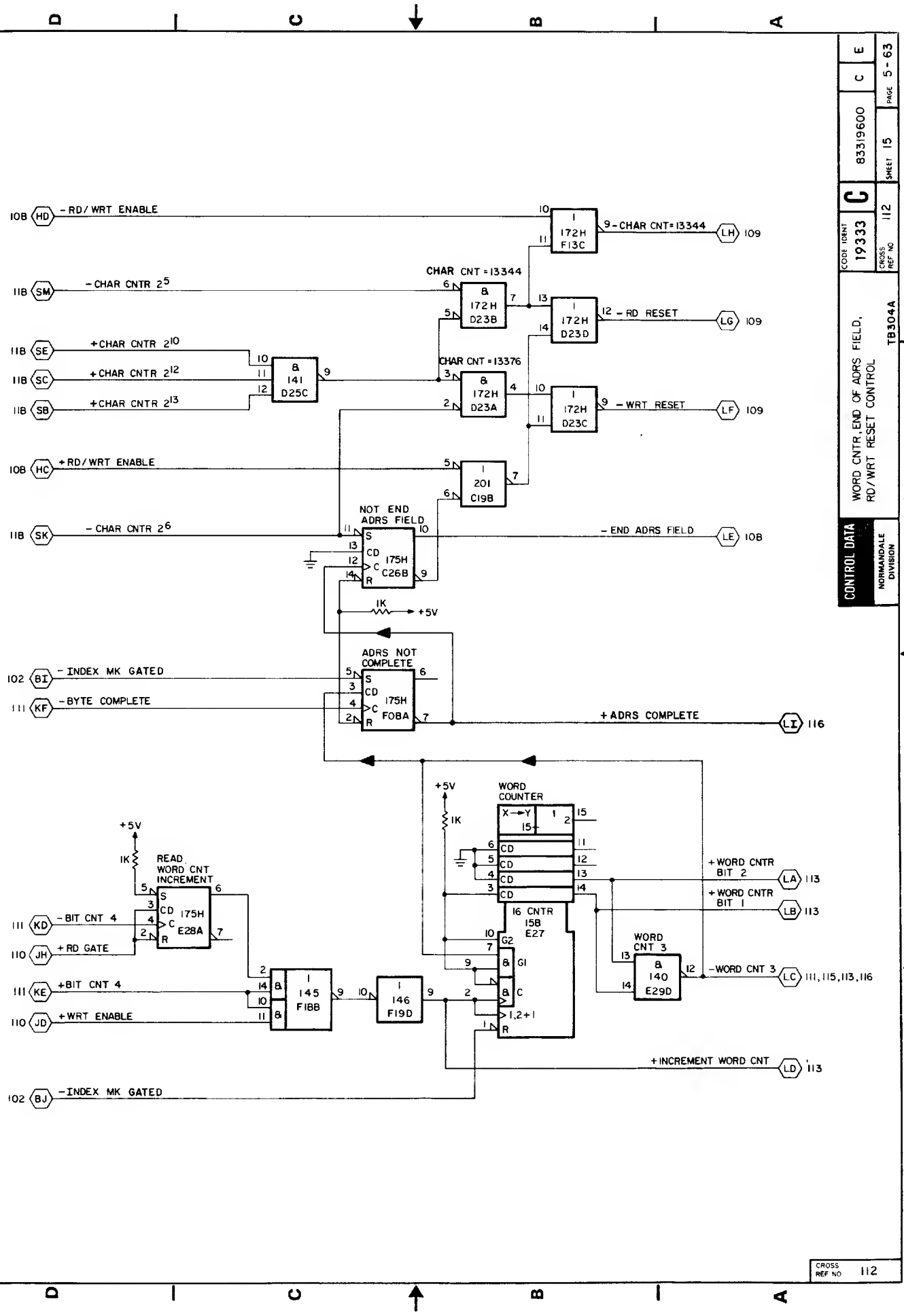

CONTROL DATA
NORMANDALE DIVISION
OFFSET CONTROL, ON CYL DETECTION
TB3044A
CODE IDENT 19333
C
83319600
SHEET 10
PAGE 5-58
CROSS REF NO 107
+OFFSET
GA 110
- OFFSET MODE
GB 110
+OFFSET REV
GC 120
+OFFSET FWD
GD 120
+ON CYL DETECTED
GE 102,108
- ON CYL DETECTED
GF 103
-OFFSET CNTL SEL
GG 120
+5V
1K
OFFSET
TEST OFFSET MODE
OFFSET MODE
NOT OFFSET I
NOT OFFSET II
TEST FOR OFFSET
DELAYED ON CYL
4MS
A2JD31-
09 - OFFSET +
202 PD31B-01
33 - OFFSET -
202 PD31B-13
-(RTZ+RESET +REL DLY)
103 CN
103 CF -T3
103 CA +T7
A2JC31-
13 +MAINT SW
201 A2PC31B-05
121 UE +GATED ON CYL
A2JE31-
01
203 A2PE31A-01
120 TJ -ENABLE HD BUS OUT
108 HD -RD/WRT ENABLE
101 AD -RUN
F09B
C07B
F24C
F09C
F24D
C07A
F23A
F14B
F14A
F09A
F18A
F19C
C18F
E29A
D04
15K
1UF
D05B
E11B
D25A
E13D
CROSS REF NO 107


+5V
1K
WRT THEN RD
175H C09A
+ WRT THEN RD
HA 110
102 BI -INDEX MK GATED
110 JE +OFFSET + (WRT • RD)
8 201 F05B
- WRT THEN RD
HB 106,110,120
109 IF +RD SYNC START
109 ID +RD START
8 141 D25B
8 173H D24C
8 201 C19D
104 DL +DIRECT
101 AA +RUN
1 140 C05C
1 146 C06F
8 140 C04B
1 146 C06C
-R/W (DIR • RUN)
HG 106
106 FG -MAX HO
106 FH -(MAN + SEQ • RANDOM)
1 140 D16B
1 145 C16A
101 AE +ERROR
LAST RD/WRT
-(LAST R/W • IM)
HH 106
A2JC31-03
201 A2PC31A-03
-OFF
1 146 D17C
-LAST RD/WRT
HF 106
102 BB +ACCESS ENABLE
175H C09B
RD/WRT ENABLE
+RD/WRT ENABLE
HC 102,106,109 110,112
8 140 C02A
1 140 D16C
175H C10A
-RD/WRT ENABLE
HD 102,107,112
102 BH +INDEX MK
102 BA +LAST ACCESS
8 143 C13B
C11
107 GE +ON CYL DETECTED
270
.0022UF
11,12
RD ADRS ENABLE
A2JC31-24
201 A2PC31A-14
- WRT FORMAT
112 LE -END ADRS FIELD
175H E11A
-RD ADRS ENABLE
HE 110
CONTROL DATA
NORMANDALE DIVISION
RD/WRT OPERATION START CONTROL
TB3304A
CODE IDENT 19333
C
83319600
SHEET 11
PAGE 5-59
CROSS REF NO 108
CROSS REF NO 108


CONTROL DATA
NORMANDALE DIVISION
RD / WRT FORMAT CONTROL I
TB304A
CODE IDENT 19333
C
83319600
SHEET 12
PAGE 5-60
CROSS REF NO 109
+WRT FORMAT
START WRT FORMAT
-START WRT FORMAT
CHAR CNT = 13,344
+RD/WRT ENABLE
WRT START
-WRT START
RD START
+RD START
-RD START
RD SYNC START
+RD SYNC START
-RD SYNC START
-RD RESET
WRT SYNC START
+ENABLE NRZ DATA
-CHAR CNTR 2^3
+CHAR CNTR 2^3
+CHAR CNTR 2^2
-WRT RESET
ENABLE BIT CNT
+ENABLE BIT CNT
-ENABLE BIT CNT
+WRT ENABLE
+START SYNC CLK
+WRT SYNC ENABLE
+RD SYNC ENABLE
+WRT SYNC/SEARCH FOR SYNC
SYNC CHECK
+WRT SYNC/FOUND SYNC
-CLK DATA
-SYNC CHECK
+5V
1K
CROSS REF NO 109


A21
+5V
5
1K
12
+WRT GATE
A2JF31-
25
204 A2PF31A-13
JA 120
A2JC31-
12
201 A2PC31B-04
+WRT INHIBIT
X/Y 200 - B21B
X/Y 200 - C1BE
-WRT GATE
A2JD31-
21
202 A2PD31C-05
JB 120
109 IB -START WRT FORMAT
109 IC -WRT START
8 172H C17A
1 146 D17D
1 173H D15A
1 146 C06A
+WRT ENABLE
JD 109,111,112
+WRT SYNC ENABLE
JC 109,114
108 HE -RD ADRS ENABLE
A2JC31-
25
201 A2PC31A-13
-WRT
24
201 A2PC31A-14
-WRT FORMAT
1 141 E12A
8 201 F10A
8 140 C03D
108 HA +WRT THEN RD
107 GB -OFFSET MODE
+RD/WRT ENABLE
108 HC
8 140 C04C
OFFSET + (WRT • RD)
JE 108
A2JC31-
02
201 A2PC31A-02
-(WRT•RD)
1 140 C03B
8 140 C04D
1 141 E12B
8 201 F05A
8 140 E15D
108 HB -WRT THEN RD
A2JC31-
01
201 A2PC31A-01
-RD
+RD SYNC ENABLE
JF 109
8 140 D12C
107 GA +OFFSET
109 IG -RD SYNC START
8 172H C17C
+RD COMPARE ENABLE
JG 111,115,116
+RD GATE
A2JF31-
24
204 A2PF31A-14
JH 112,116,120
109 IE -RD START
8 172H C17B
X/Y 200 - C1BD
-RD GATE
A2JD31-
20
202 A2PD31C-04
JJ 111,120
A2JD31-
14
202 A2PD31B-06
-STR EARLY
8 172H C14C
+DATA STRB EARLY
JK 120
202 A2PD31B-03
11
-STR LATE
8 172H C14D
+DATA STRB LATE
JL 120
CONTROL DATA
NORMANDALE DIVISION
RD/WRT FORMAT CONTROL II
TB304A
CODE IDENT 19333
C
CROSS REF NO 110
83319600
SHEET 13
PAGE 5-61
A
C
CROSS REF NO 110


BIT CNTR, WRT SYNC / FOUND SYNC AND ADRS MK LOGIC
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
CROSS REF NO
C
83319600
SHEET 14
PAGE 5-62
A
C
BIT CNTR
16 CNTR 15B E26
+ BIT CNT 4
- BIT CNT 4
- BYTE COMPLETE
+BYTE COMPLETE
+ENABLE BIT CNT
+ INDEX MK
WRT SYNC / FOUND SYNC
+ WRT SYNC / FOUND SYNC
- WRT SYNC / FOUND SYNC
+ WRT SYNC / SEARCH FOR SYNC
+ PATTERN REG BIT 7
+ PATTERN REG BIT 6
- CLK DATA
+ WRT ENABLE
- FTU WRT CLK
- RD CLK
+ START SYNC CLK
- ERROR
+ RD COMPARE ENABLE
+ RD CLK •(- RD ERROR)
A2JF31-09
204 A2PF31B-01
AM SEARCH
- ADRS MK ERROR
+ WRT FORMAT
- RD GATE
+ AM FOUND
+ RESET
+ ADRS MK ENABLE
A2JC31-24
- WRT FORMAT SW
201 A2PC31A-14
37
+ ADRS MK SW
201 A2PC31B-09
- CHAR CNTR 2^2
WRITE AM
START AM
+ RD START
- WORD CNT 3
+ CHAR CNTR 2^0
- INDEX MK GATED
+5V
1K
CROSS REF NO 111



CONTROL DATA NORMANDALE DIVISION

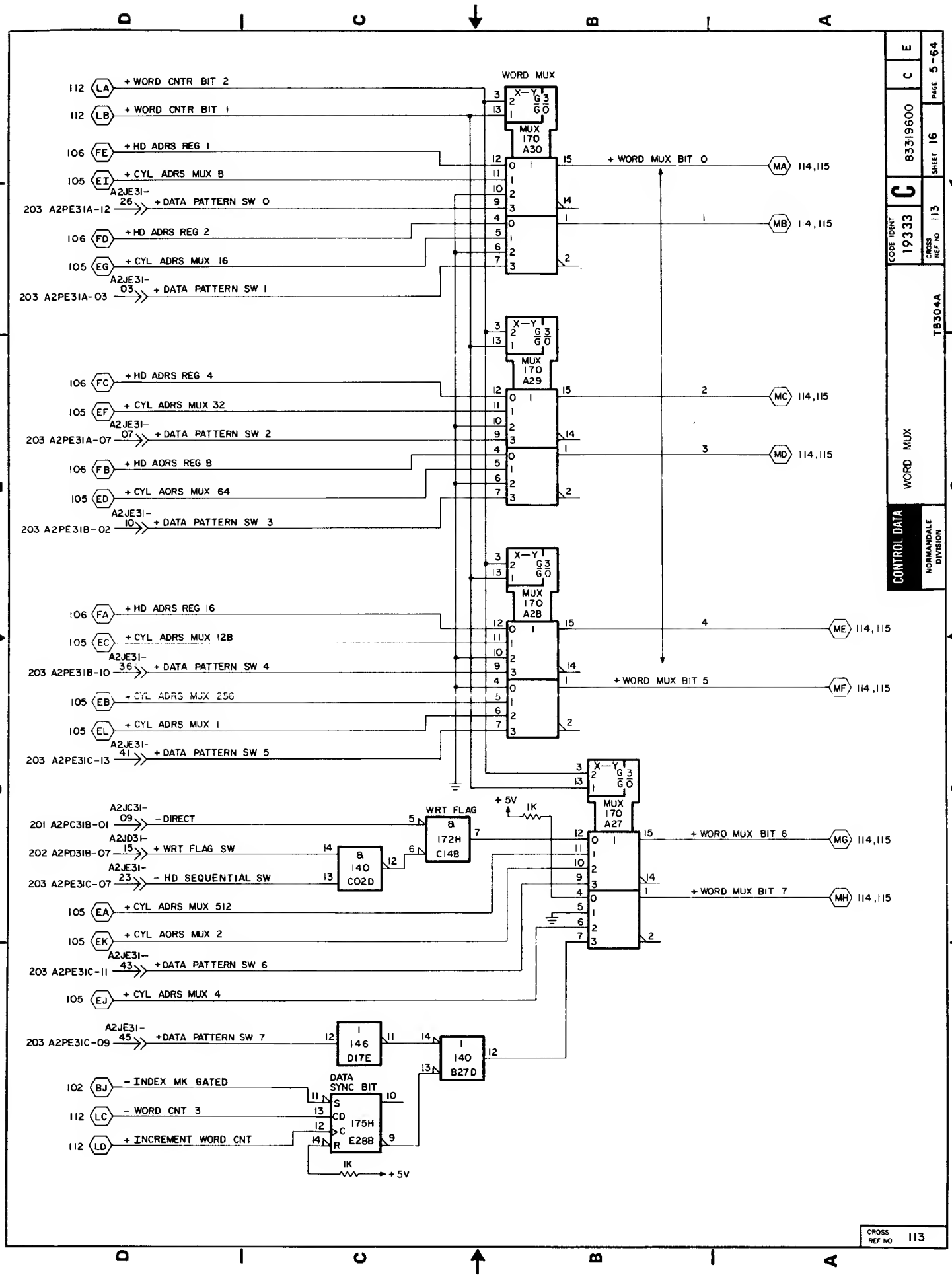
WORD CNTR, END OF ADRS FIELD, RD/WRT RESET CONTROL

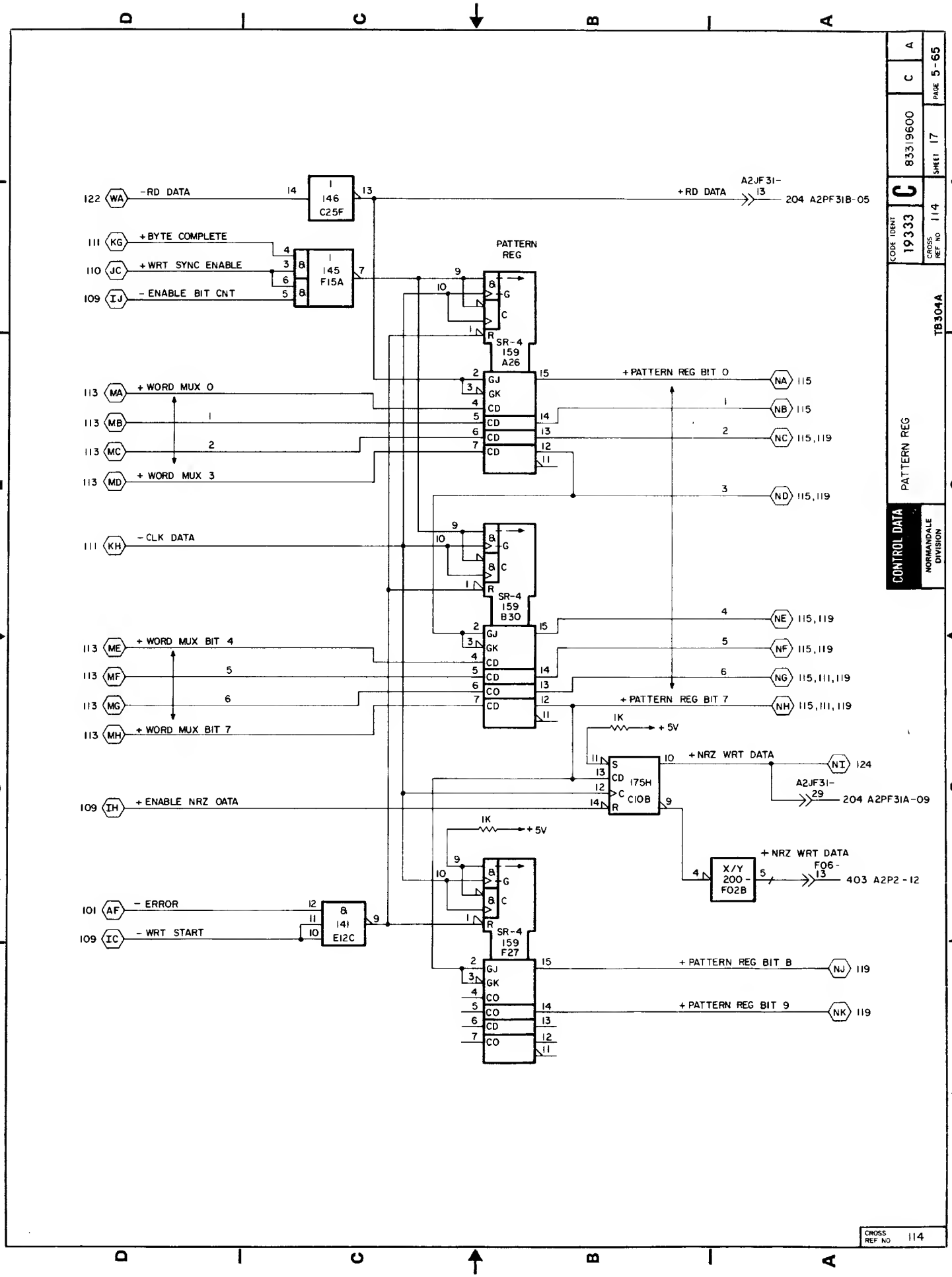
TB304A

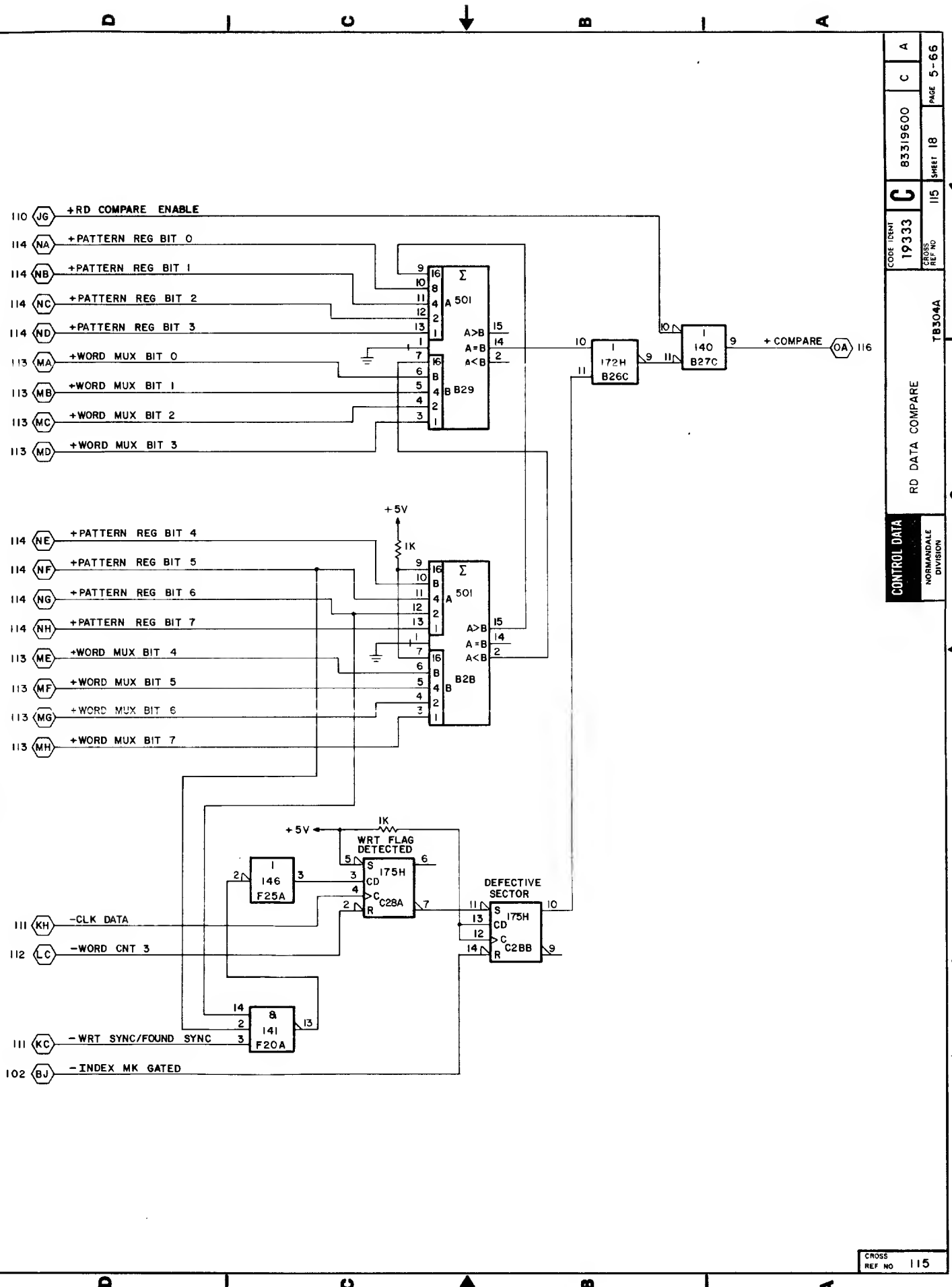
CODE IDENT 19333 | C | 83319600 | SHEET 15 | PAGE 5-63

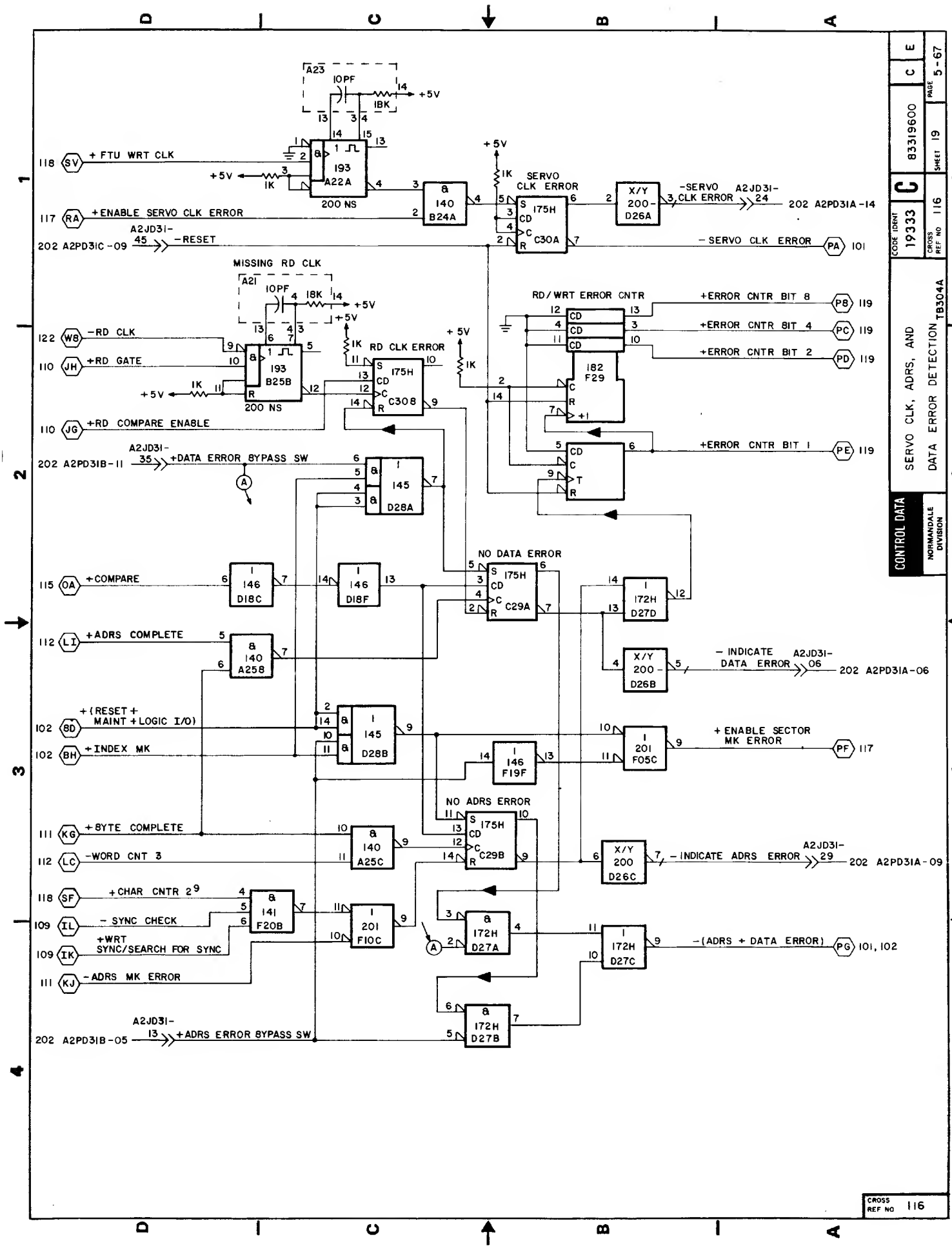
CROSS REF NO 112

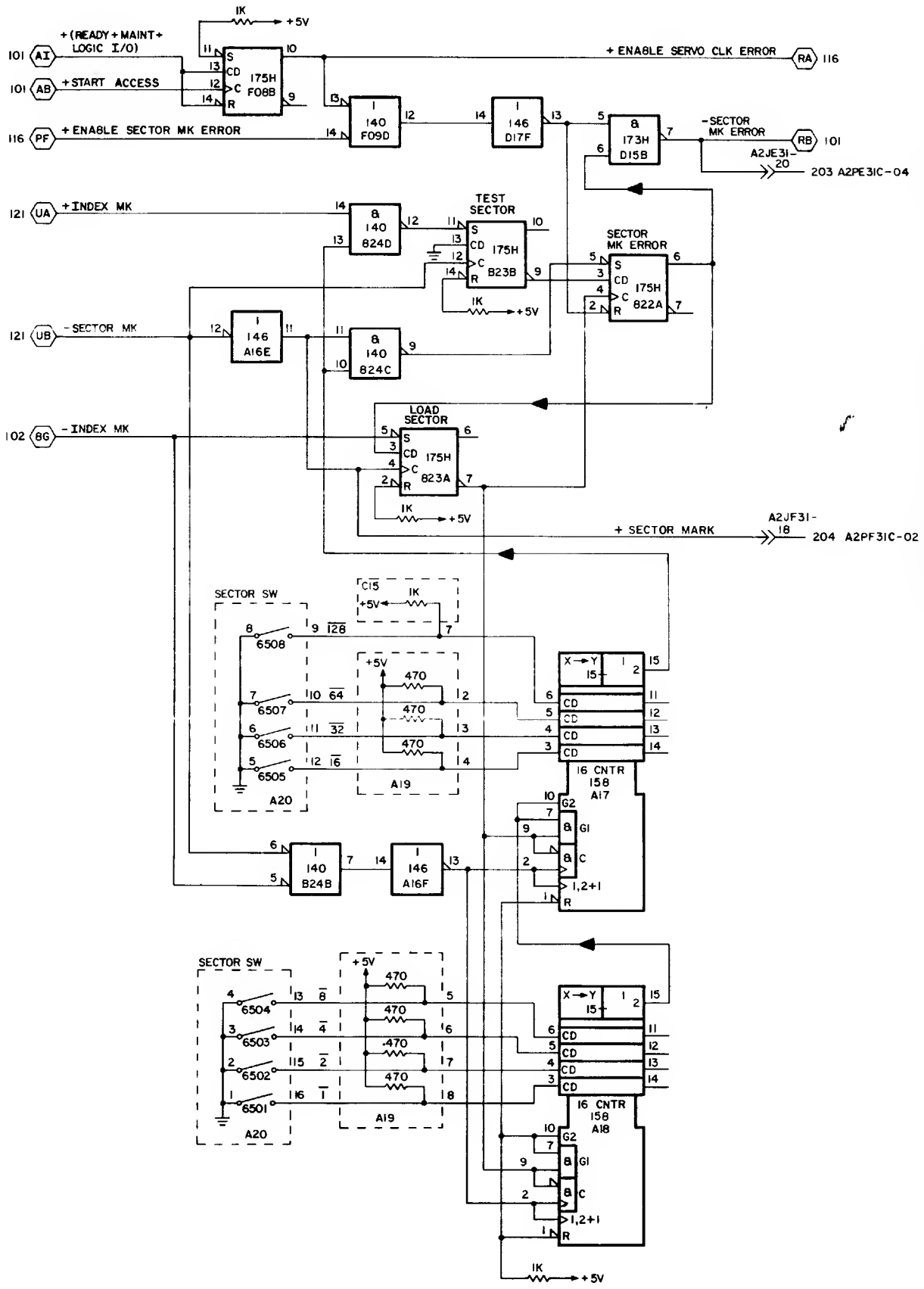
CROSS REF NO 112

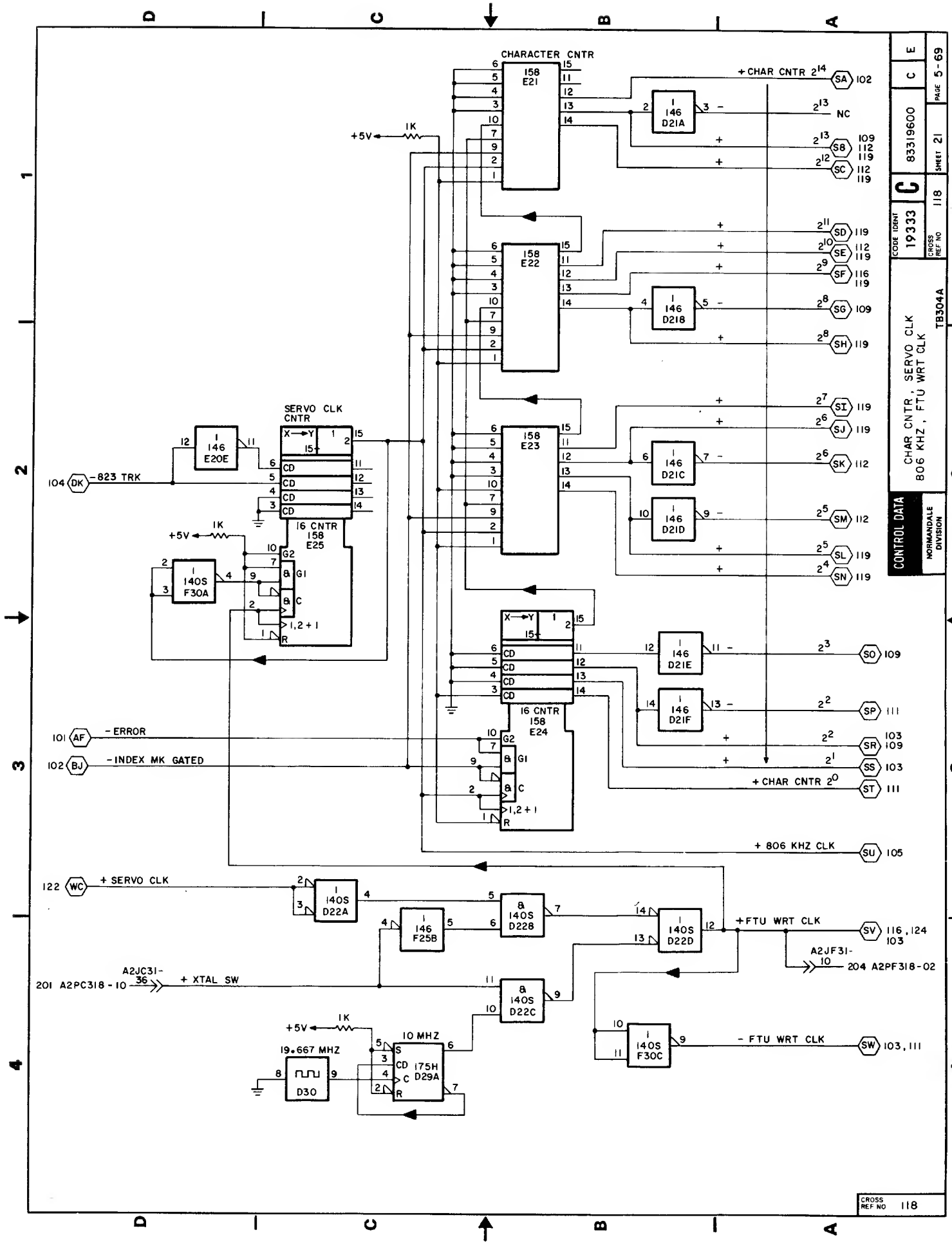

WORD MUX
MUX 170 A30
MUX 170 A29
MUX 170 A28
MUX 170 A27
112 LA + WORD CNTR BIT 2
112 LB + WORD CNTR BIT 1
106 FE + HD ADRS REG 1
105 EI + CYL ADRS MUX 8
A2JE3I-26 203 A2PE31A-12 + DATA PATTERN SW 0
106 FD + HD ADRS REG 2
105 EG + CYL ADRS MUX 16
A2JE3I-03 203 A2PE31A-03 + DATA PATTERN SW 1
106 FC + HD ADRS REG 4
105 EF + CYL ADRS MUX 32
A2JE3I-07 203 A2PE31A-07 + DATA PATTERN SW 2
106 FB + HD AORS REG 8
105 ED + CYL AORS MUX 64
A2JE3I-10 203 A2PE31B-02 + DATA PATTERN SW 3
106 FA + HD ADRS REG 16
105 EC + CYL ADRS MUX 128
A2JE3I-36 203 A2PE31B-10 + DATA PATTERN SW 4
105 EB + CYL ADRS MUX 256
105 EL + CYL ADRS MUX 1
A2JE3I-41 203 A2PE31C-13 + DATA PATTERN SW 5
+ WORD MUX BIT 0
+ WORD MUX BIT 5
+ WORD MUX BIT 6
+ WORD MUX BIT 7
MA 114,115
MB 114,115
MC 114,115
MD 114,115
ME 114,115
MF 114,115
MG 114,115
MH 114,115
+5V 1K
A2JC3I-09 201 A2PC31B-01 - DIRECT
A2JD3I-15 202 A2PD31B-07 + WRT FLAG SW
A2JE3I-23 203 A2PE31C-07 - HD SEQUENTIAL SW
WRT FLAG 8 172H C14B
8 140 C02D
105 EA + CYL ADRS MUX 512
105 EK + CYL AORS MUX 2
A2JE3I-43 203 A2PE31C-11 + DATA PATTERN SW 6
105 EJ + CYL ADRS MUX 4
A2JE3I-45 203 A2PE31C-09 + DATA PATTERN SW 7
1 146 D17E
1 140 B27D
102 BJ - INDEX MK GATED
112 LC - WORD CNT 3
112 LD + INCREMENT WORD CNT
DATA SYNC BIT
175H E28B
1K +5V
CONTROL DATA
NORMANDALE DIVISION
WORD MUX
TB3044A
CODE IDENT 19333
C
83319600
SHEET 16
PAGE 5-64
CROSS REF NO 113
CROSS REF NO 113

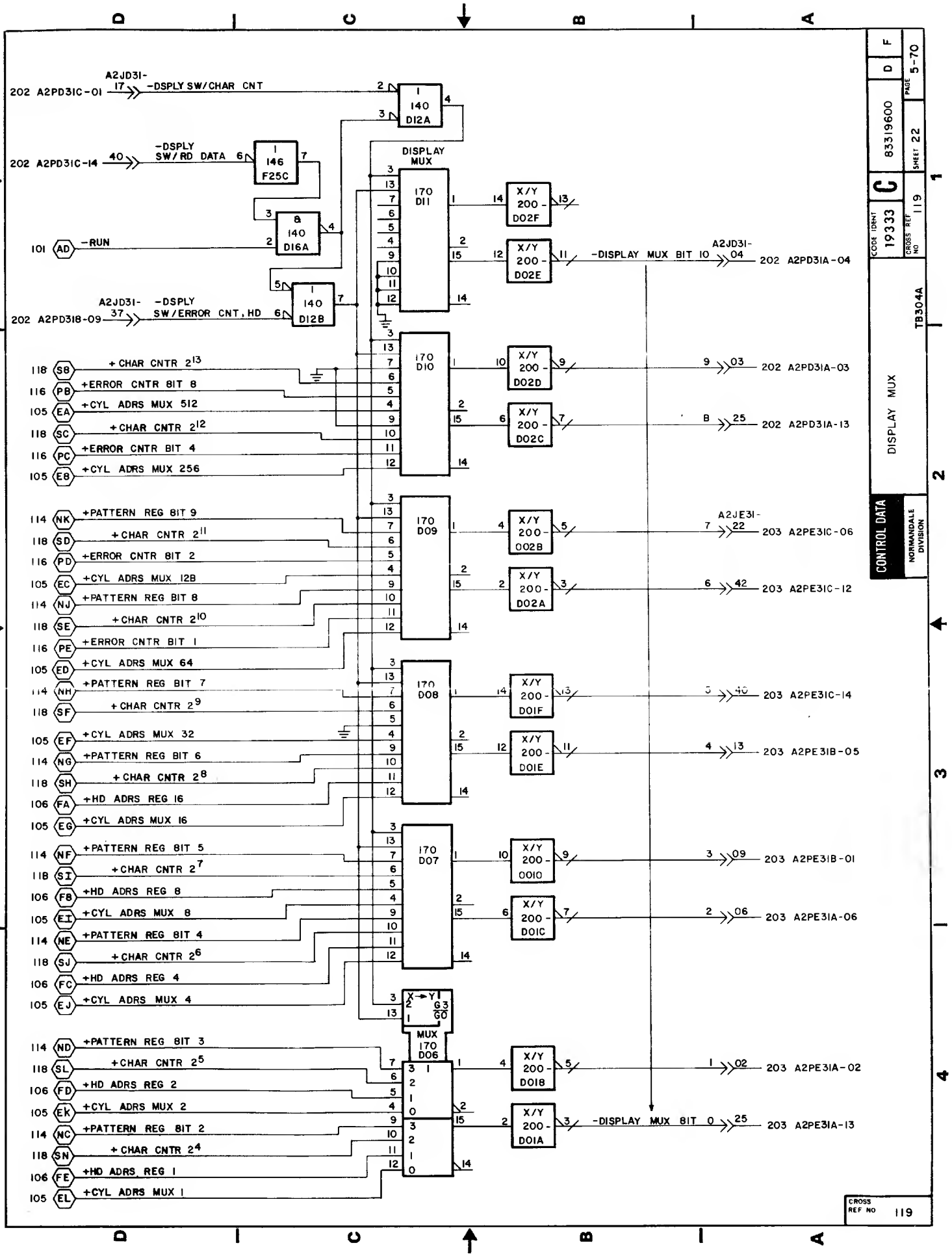

122 WA -RD DATA
146 C25F
+RD DATA
A2JF31-13
204 A2PF31B-05
111 KG +BYTE COMPLETE
110 JC +WRT SYNC ENABLE
109 IJ - ENABLE BIT CNT
145 F15A
PATTERN REG
SR-4 159 A26
+PATTERN REG BIT 0
NA 115
NB 115
NC 115,119
ND 115,119
113 MA +WORD MUX 0
113 MB 1
113 MC 2
113 MD +WORD MUX 3
111 KH -CLK DATA
SR-4 159 B30
NE 115,119
NF 115,119
NG 115,111,119
NH 115,111,119
+PATTERN REG BIT 7
113 ME +WORD MUX BIT 4
113 MF 5
113 MG 6
113 MH +WORD MUX BIT 7
1K
+5V
175H C10B
+NRZ WRT DATA
NI 124
A2JF31-29
204 A2PF31A-09
109 IH +ENABLE NRZ OATA
X/Y 200-F028
F06-13
403 A2P2-12
101 AF - ERROR
109 IC - WRT START
141 E12C
SR-4 159 F27
+PATTERN REG BIT B
NJ 119
+PATTERN REG BIT 9
NK 119
CONTROL DATA
NORMANDALE DIVISION
PATTERN REG
TB304A
CODE IDENT 19333
C
83319600
SHEET 17
PAGE 5-65
CROSS REF NO 114
CROSS REF NO 114

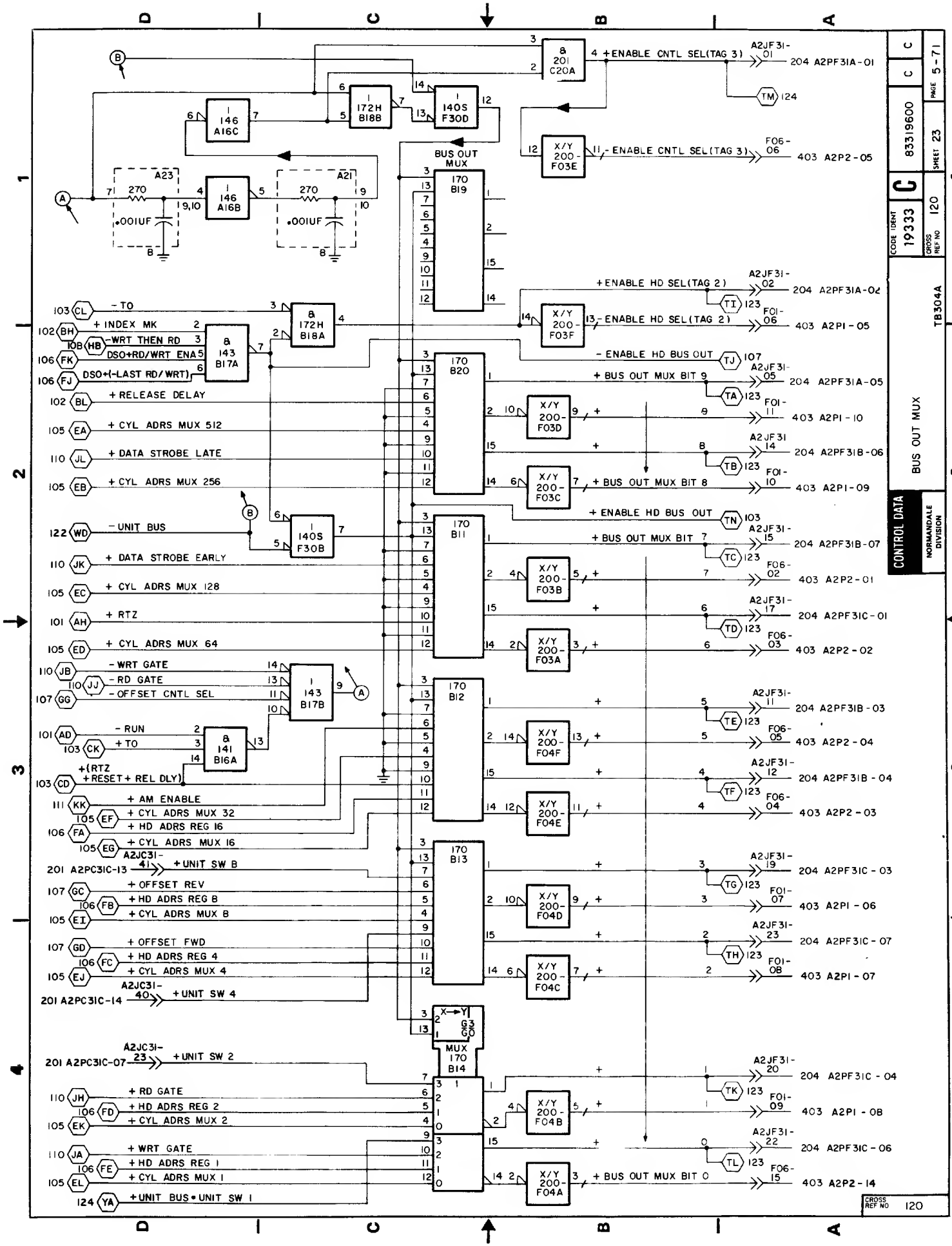

110 JG +RD COMPARE ENABLE
114 NA +PATTERN REG BIT 0
114 NB +PATTERN REG BIT 1
114 NC +PATTERN REG BIT 2
114 ND +PATTERN REG BIT 3
113 MA +WORD MUX BIT 0
113 MB +WORD MUX BIT 1
113 MC +WORD MUX BIT 2
113 MD +WORD MUX BIT 3
Σ A 501
A>B A=B A<B
B B29
1 172H B26C
1 140 B27C
+ COMPARE OA 116
+5V
1K
114 NE +PATTERN REG BIT 4
114 NF +PATTERN REG BIT 5
114 NG +PATTERN REG BIT 6
114 NH +PATTERN REG BIT 7
113 ME +WORD MUX BIT 4
113 MF +WORD MUX BIT 5
113 MG +WORD MUX BIT 6
113 MH +WORD MUX BIT 7
B B28
WRT FLAG DETECTED
S CD C R 175H C28A
1 146 F25A
DEFECTIVE SECTOR
S CD C R 175H C2BB
111 KH -CLK DATA
112 LC -WORD CNT 3
8 141 F20A
111 KC -WRT SYNC/FOUND SYNC
102 BJ -INDEX MK GATED
CONTROL DATA
NORMANDALE DIVISION
RD DATA COMPARE
TB304A
CODE IDENT 19333
CROSS REF NO 115
C
83319600
SHEET 18
PAGE 5-66
A
C
CROSS REF NO 115

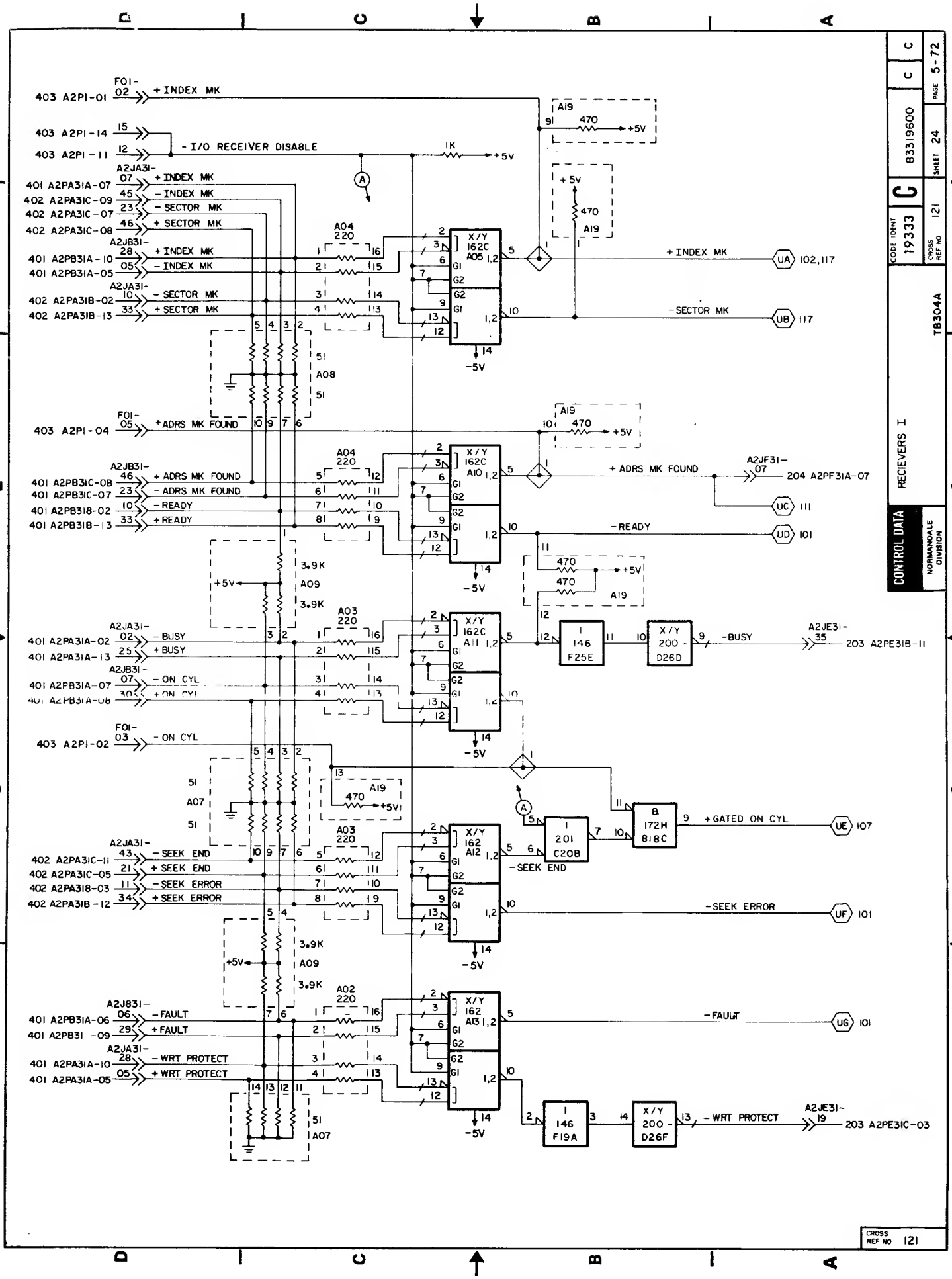

A23
10PF
18K
+5V
193
A22A
200 NS
140
B24A
118 SV + FTU WRT CLK
117 RA +ENABLE SERVO CLK ERROR
A2JD3I-
202 A2PD3IC-09 45 -RESET
SERVO CLK ERROR
175H
C30A
X/Y 200-D26A
-SERVO CLK ERROR A2JD3I-24
202 A2PD3IA-14
-SERVO CLK ERROR PA 101
MISSING RD CLK
A21
122 W8 -RD CLK
110 JH +RD GATE
110 JG +RD COMPARE ENABLE
193
B25B
200 NS
RD CLK ERROR
175H
C30B
RD/WRT ERROR CNTR
182
F29
+ERROR CNTR BIT 8 P8 119
+ERROR CNTR BIT 4 PC 119
+ERROR CNTR BIT 2 PD 119
+ERROR CNTR BIT 1 PE 119
202 A2PD3IB-11 35 +DATA ERROR BYPASS SW
145
D28A
115 OA +COMPARE
146
D18C
146
D18F
NO DATA ERROR
175H
C29A
172H
D27D
112 LI +ADRS COMPLETE
140
A25B
X/Y 200-D26B
-INDICATE DATA ERROR A2JD3I-06
202 A2PD3IA-06
102 8D +(RESET + MAINT + LOGIC I/O)
102 BH +INDEX MK
145
D28B
146
F19F
201
F05C
+ENABLE SECTOR MK ERROR PF 117
NO ADRS ERROR
175H
C29B
111 KG +BYTE COMPLETE
112 LC -WORD CNT 3
140
A25C
X/Y 200 D26C
-INDICATE ADRS ERROR A2JD3I-29
202 A2PD3IA-09
118 SF +CHAR CNTR 2^9
109 IL - SYNC CHECK
109 IK +WRT SYNC/SEARCH FOR SYNC
111 KJ -ADRS MK ERROR
141
F20B
201
F10C
172H
D27A
172H
D27C
-(ADRS + DATA ERROR) PG 101, 102
202 A2PD3IB-05 13 +ADRS ERROR BYPASS SW
172H
D27B
CONTROL DATA
NORMANDALE DIVISION
SERVO CLK, ADRS, AND DATA ERROR DETECTION TB304A
CODE IDENT 19333
CROSS REF NO 116
8331960 C
SHEET 19
PAGE 5-67
C E
CROSS REF NO 116

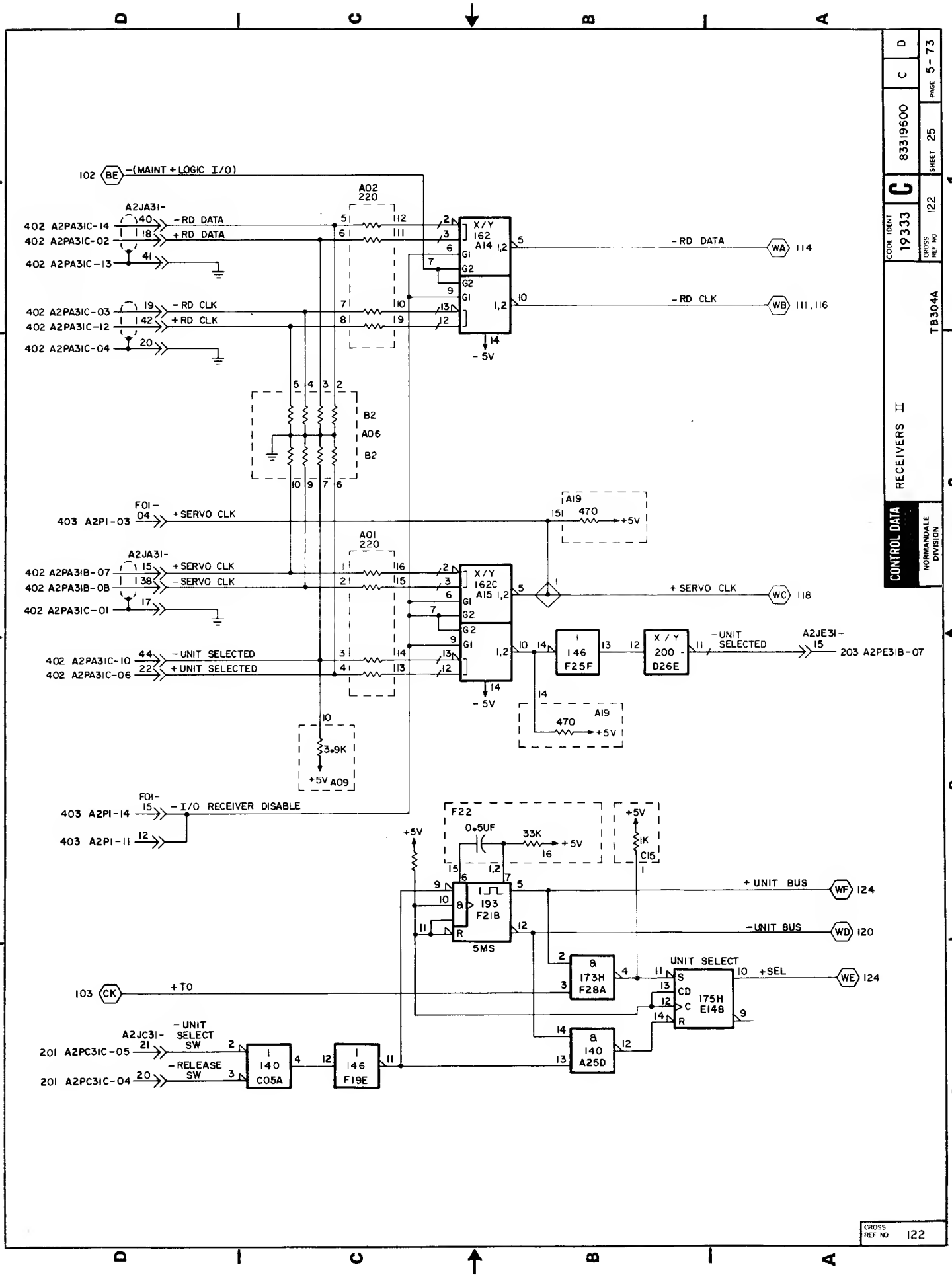

+(READY+MAINT+ LOGIC I/O)
+START ACCESS
+ENABLE SECTOR MK ERROR
+ENABLE SERVO CLK ERROR
-SECTOR MK ERROR
+INDEX MK
-SECTOR MK
-INDEX MK
TEST SECTOR
SECTOR MK ERROR
LOAD SECTOR
+ SECTOR MARK
SECTOR SW
16 CNTR 158 A17
16 CNTR 158 A18
A20
A19
1K
+5V
470
175H F08B
140 F09D
146 D17F
173H D15B
140 824D
175H B23B
175H 822A
146 A16E
140 824C
175H 823A
140 B24B
146 A16F
6508
6507
6506
6505
6504
6503
6502
6501
A2JE31-20
203 A2PE31C-04
A2JF31-18
204 A2PF31C-02
CONTROL DATA
NORMANDALE DIVISION
SECTOR COUNTING AND ERROR DETECTION
TB304A
CODE IDENT 19333
CROSS REF NO 117
83319600
SHEET 20
PAGE 5-68
CROSS REF NO 117

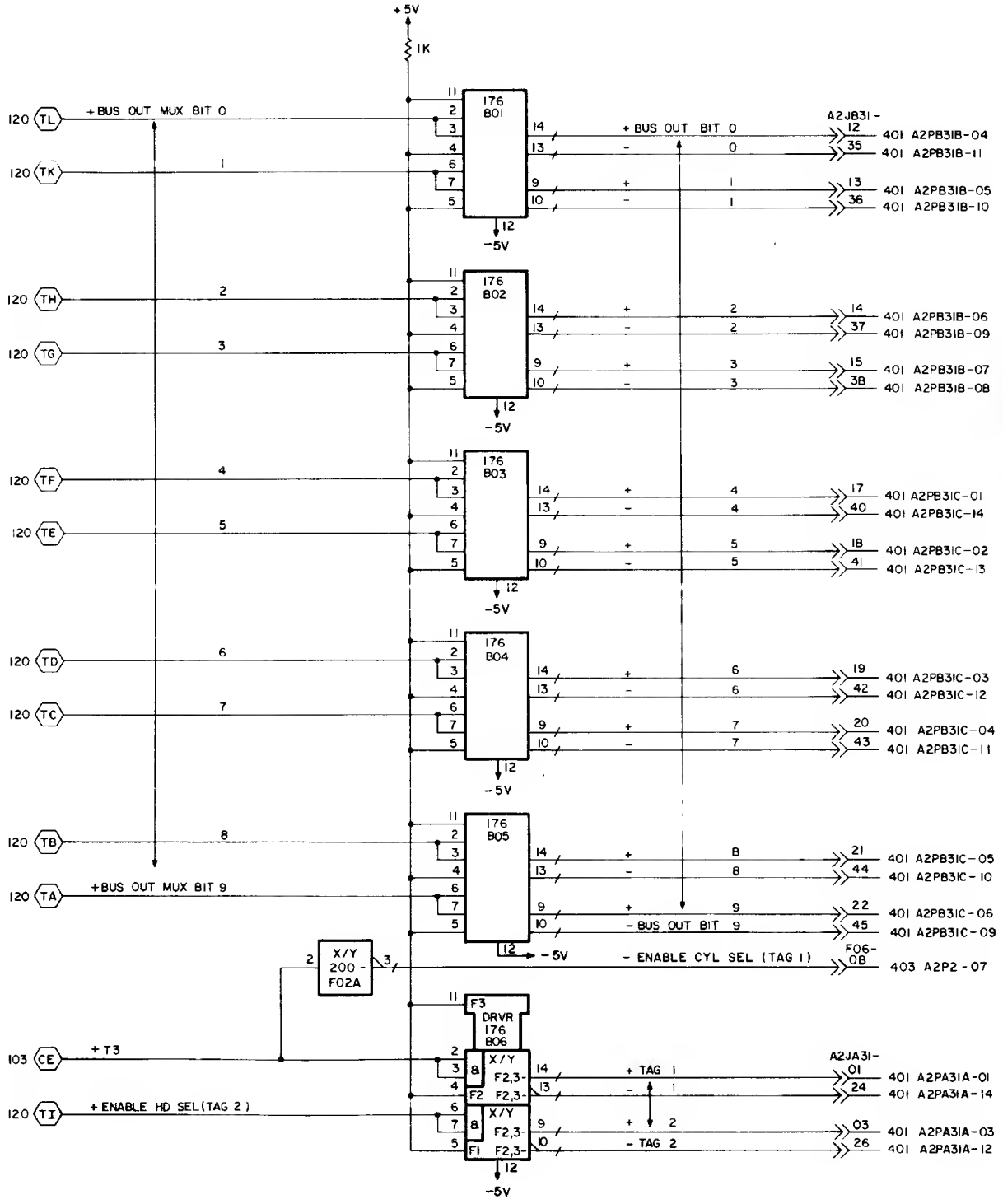

CHARACTER CNTR
158 E21
158 E22
158 E23
+CHAR CNTR 2^14 SA 102
2^13 NC
2^13 S8 109 112 119
2^12 SC 112 119
2^11 SD 119
2^10 SE 112 119
2^9 SF 116 119
2^8 SG 109
2^8 SH 119
2^7 SI 119
2^6 SJ 119
2^6 SK 112
2^5 SM 112
2^5 SL 119
2^4 SN 119
1 146 D21A
1 146 D21B
1 146 D21C
1 146 D21D
1 146 D21E
1 146 D21F
+5V 1K
SERVO CLK CNTR
1 146 E20E
104 DK -823 TRK
16 CNTR 158 E25
1 140S F30A
16 CNTR 158 E24
101 AF -ERROR
102 BJ -INDEX MK GATED
2^3 SO 109
2^2 SP 111
2^2 SR 103 109
2^1 SS 103
+CHAR CNTR 2^0 ST 111
+ 806 KHZ CLK SU 105
122 WC + SERVO CLK
1 140S D22A
8 140S D22B
1 146 F25B
1 140S D22D
+FTU WRT CLK SV 116,124 103
A2JF31-10 204 A2PF318-02
201 A2PC318-10 A2JC31-36 + XTAL SW
8 140S D22C
1 140S F30C
- FTU WRT CLK SW 103,111
10 MHZ
19.667 MHZ
D30
175H D29A
CONTROL DATA
NORMANDALE DIVISION
CHAR CNTR, SERVO CLK
806 KHZ, FTU WRT CLK
TB304A
CODE IDENT 19333
C 83319600
SHEET 21
PAGE 5-69
CROSS REF NO 118


DISPLAY MUX
TB304A
DISPLAY MUX
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
CROSS REF NO 119
83319600
SHEET 22
PAGE 5-70
CROSS REF NO 119
202 A2PD31C-01 A2JD31-17 -DSPLY SW/CHAR CNT
202 A2PD31C-14 40 -DSPLY SW/RD DATA 6
101 AD -RUN
202 A2PD31B-09 A2JD31-37 -DSPLY SW/ERROR CNT, HD 6
I 140 D12A
I 146 F25C
8 140 D16A
I 140 D12B
170 D11
170 D10
170 D09
170 D08
170 D07
X→Y 2 1 G3 G0
MUX 170 D06
X/Y 200-D02F
X/Y 200-D02E
X/Y 200-D02D
X/Y 200-D02C
X/Y 200-002B
X/Y 200-D02A
X/Y 200-D01F
X/Y 200-D01E
X/Y 200-0010
X/Y 200-D01C
X/Y 200-D01B
X/Y 200-D01A
-DISPLAY MUX BIT 10 A2JD31-04 202 A2PD31A-04
9 03 202 A2PD31A-03
B 25 202 A2PD31A-13
A2JE31-7 22 203 A2PE31C-06
6 42 203 A2PE31C-12
5 40 203 A2PE31C-14
4 13 203 A2PE31B-05
3 09 203 A2PE31B-01
2 06 203 A2PE31A-06
1 02 203 A2PE31A-02
-DISPLAY MUX BIT 0 25 203 A2PE31A-13
118 SB +CHAR CNTR 2^13
116 PB +ERROR CNTR BIT 8
105 EA +CYL ADRS MUX 512
118 SC +CHAR CNTR 2^12
116 PC +ERROR CNTR BIT 4
105 E8 +CYL ADRS MUX 256
114 NK +PATTERN REG BIT 9
118 SD +CHAR CNTR 2^11
116 PD +ERROR CNTR BIT 2
105 EC +CYL ADRS MUX 128
114 NJ +PATTERN REG BIT 8
118 SE +CHAR CNTR 2^10
116 PE +ERROR CNTR BIT 1
105 ED +CYL ADRS MUX 64
114 NH +PATTERN REG BIT 7
118 SF +CHAR CNTR 2^9
105 EF +CYL ADRS MUX 32
114 NG +PATTERN REG BIT 6
118 SH +CHAR CNTR 2^8
106 FA +HD ADRS REG 16
105 EG +CYL ADRS MUX 16
114 NF +PATTERN REG BIT 5
118 SI +CHAR CNTR 2^7
106 F8 +HD ADRS REG 8
105 EI +CYL ADRS MUX 8
114 NE +PATTERN REG BIT 4
118 SJ +CHAR CNTR 2^6
106 FC +HD ADRS REG 4
105 EJ +CYL ADRS MUX 4
114 ND +PATTERN REG BIT 3
118 SL +CHAR CNTR 2^5
106 FD +HD ADRS REG 2
105 EK +CYL ADRS MUX 2
114 NC +PATTERN REG BIT 2
118 SN +CHAR CNTR 2^4
106 FE +HD ADRS REG 1
105 EL +CYL ADRS MUX 1


CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
83319600
SHEET 23
PAGE 5-71
TB304A
BUS OUT MUX
CROSS REF NO 120
BUS OUT MUX
+ENABLE CNTL SEL(TAG 3)
+ENABLE HD SEL(TAG 2)
- ENABLE HD BUS OUT
+ BUS OUT MUX BIT 9
+ BUS OUT MUX BIT 8
+ BUS OUT MUX BIT 7
+ BUS OUT MUX BIT 0
- TO
+ INDEX MK
-WRT THEN RD
DSO+RD/WRT ENA
DSO+(-LAST RD/WRT)
+ RELEASE DELAY
+ CYL ADRS MUX 512
+ DATA STROBE LATE
+ CYL ADRS MUX 256
- UNIT BUS
+ DATA STROBE EARLY
+ CYL ADRS MUX 128
+ RTZ
+ CYL ADRS MUX 64
- WRT GATE
- RD GATE
- OFFSET CNTL SEL
- RUN
+ TO
+(RTZ +RESET+ REL DLY)
+ AM ENABLE
+ CYL ADRS MUX 32
+ HD ADRS REG 16
+ CYL ADRS MUX 16
+ UNIT SW B
+ OFFSET REV
+ HD ADRS REG B
+ CYL ADRS MUX 8
+ OFFSET FWD
+ HD ADRS REG 4
+ CYL ADRS MUX 4
+ UNIT SW 4
+ UNIT SW 2
+ RD GATE
+ HD ADRS REG 2
+ CYL ADRS MUX 2
+ WRT GATE
+ HD ADRS REG 1
+ CYL ADRS MUX 1
+UNIT BUS • UNIT SW 1
A2JF31-01 204 A2PF31A-01
A2JF31-02 204 A2PF31A-02
A2JF31-05 204 A2PF31A-05
A2JF31-14 204 A2PF31B-06
A2JF31-15 204 A2PF31B-07
A2JF31-17 204 A2PF31C-01
A2JF31-11 204 A2PF31B-03
A2JF31-12 204 A2PF31B-04
A2JF31-19 204 A2PF31C-03
A2JF31-23 204 A2PF31C-07
A2JF31-20 204 A2PF31C-04
A2JF31-22 204 A2PF31C-06
F06-06 403 A2P2-05
F01-06 403 A2P1-05
F01-11 403 A2P1-10
F01-10 403 A2P1-09
F06-02 403 A2P2-01
F06-03 403 A2P2-02
F06-05 403 A2P2-04
F06-04 403 A2P2-03
F01-07 403 A2P1-06
F01-08 403 A2P1-07
F01-09 403 A2P1-08
F06-15 403 A2P2-14
A2JC31-41 201 A2PC31C-13
A2JC31-40 201 A2PC31C-14
A2JC31-23 201 A2PC31C-07
CROSS REF NO 120


403 A2P1-01 F01-02 +INDEX MK
403 A2P1-14 15
403 A2P1-11 12 -I/O RECEIVER DISABLE
1K +5V
A19 91 470 +5V
A2JA31-
401 A2PA31A-07 07 +INDEX MK
402 A2PA31C-09 45 -INDEX MK
402 A2PA31C-07 23 -SECTOR MK
402 A2PA31C-08 46 +SECTOR MK
A2JB31-
401 A2PB31A-10 28 +INDEX MK
401 A2PB31A-05 05 -INDEX MK
A2JA31-
402 A2PA31B-02 10 -SECTOR MK
402 A2PA31B-13 33 +SECTOR MK
A04 220
A08 5.1K
X/Y 162C A05 1,2
+INDEX MK UA 102,117
-SECTOR MK UB 117
-5V
403 A2P1-04 F01-05 +ADRS MK FOUND
A19 10 470 +5V
A2JB31-
401 A2PB31C-08 46 +ADRS MK FOUND
401 A2PB31C-07 23 -ADRS MK FOUND
401 A2PB31B-02 10 -READY
401 A2PB31B-13 33 +READY
A04 220
X/Y 162C A10 1,2
+ADRS MK FOUND A2JF31-07 204 A2PF31A-07
UC 111
-READY UD 101
A09 3.9K
A19 470 470 +5V
A2JA31-
401 A2PA31A-02 02 -BUSY
401 A2PA31A-13 25 +BUSY
A03 220
X/Y 162C A11 1,2
I 146 F25E
X/Y 200-D26D
-BUSY A2JE31-35 203 A2PE31B-11
A2JB31-
401 A2PB31A-07 07 -ON CYL
401 A2PB31A-08 30 +ON CYL
403 A2P1-02 F01-03 -ON CYL
A07 5.1K
A19 470 +5V
A
I 201 C20B
B 172H 818C
+GATED ON CYL UE 107
A2JA31-
402 A2PA31C-11 43 -SEEK END
402 A2PA31C-05 21 +SEEK END
402 A2PA31B-03 11 -SEEK ERROR
402 A2PA31B-12 34 +SEEK ERROR
A03 220
X/Y 162 A12 1,2
-SEEK END
-SEEK ERROR UF 101
A09 3.9K
A02 220
A2JB31-
401 A2PB31A-06 06 -FAULT
401 A2PB31 -09 29 +FAULT
A2JA31-
401 A2PA31A-10 28 -WRT PROTECT
401 A2PA31A-05 05 +WRT PROTECT
X/Y 162 A13 1,2
-FAULT UG 101
A07 5.1K
I 146 F19A
X/Y 200-D26F
-WRT PROTECT A2JE31-19 203 A2PE31C-03
CONTROL DATA NORMANDALE DIVISION
RECIEVERS I
TB304A
CODE IDENT 19333 C
CROSS REF NO 121
83319600 C
SHEET 24
PAGE 5-72
CROSS REF NO 121


CONTROL DATA
NORMANDALE DIVISION
RECEIVERS II
TB304A
CODE IDENT 19333
C
83319600
SHEET 25
PAGE 5-73
CROSS REF NO 122
102 BE -(MAINT + LOGIC I/O)
A2JA31-
402 A2PA31C-14 -RD DATA
402 A2PA31C-02 +RD DATA
402 A2PA31C-13
402 A2PA31C-03 -RD CLK
402 A2PA31C-12 +RD CLK
402 A2PA31C-04
A02 220
X/Y 162 A14
-RD DATA WA 114
-RD CLK WB 111, 116
-5V
B2 A06 B2
FOI-
403 A2PI-03 +SERVO CLK
A19 470 +5V
A01 220
402 A2PA31B-07 +SERVO CLK
402 A2PA31B-08 -SERVO CLK
402 A2PA31C-01
X/Y 162C A15
+SERVO CLK WC 118
402 A2PA31C-10 -UNIT SELECTED
402 A2PA31C-06 +UNIT SELECTED
146 F25F
X/Y 200 - D26E
-UNIT SELECTED
A2JE31- 15 203 A2PE31B-07
3.9K +5V A09
403 A2PI-14 -I/O RECEIVER DISABLE
403 A2PI-11
F22 0.5UF 33K +5V
1K C15
+UNIT BUS WF 124
193 F21B 5MS
-UNIT BUS WD 120
103 CK +TO
173H F28A
UNIT SELECT
175H E148
+SEL WE 124
A2JC31- -UNIT SELECT SW
201 A2PC31C-05
-RELEASE SW
201 A2PC31C-04
140 C05A
146 F19E
140 A25D
CROSS REF NO 122

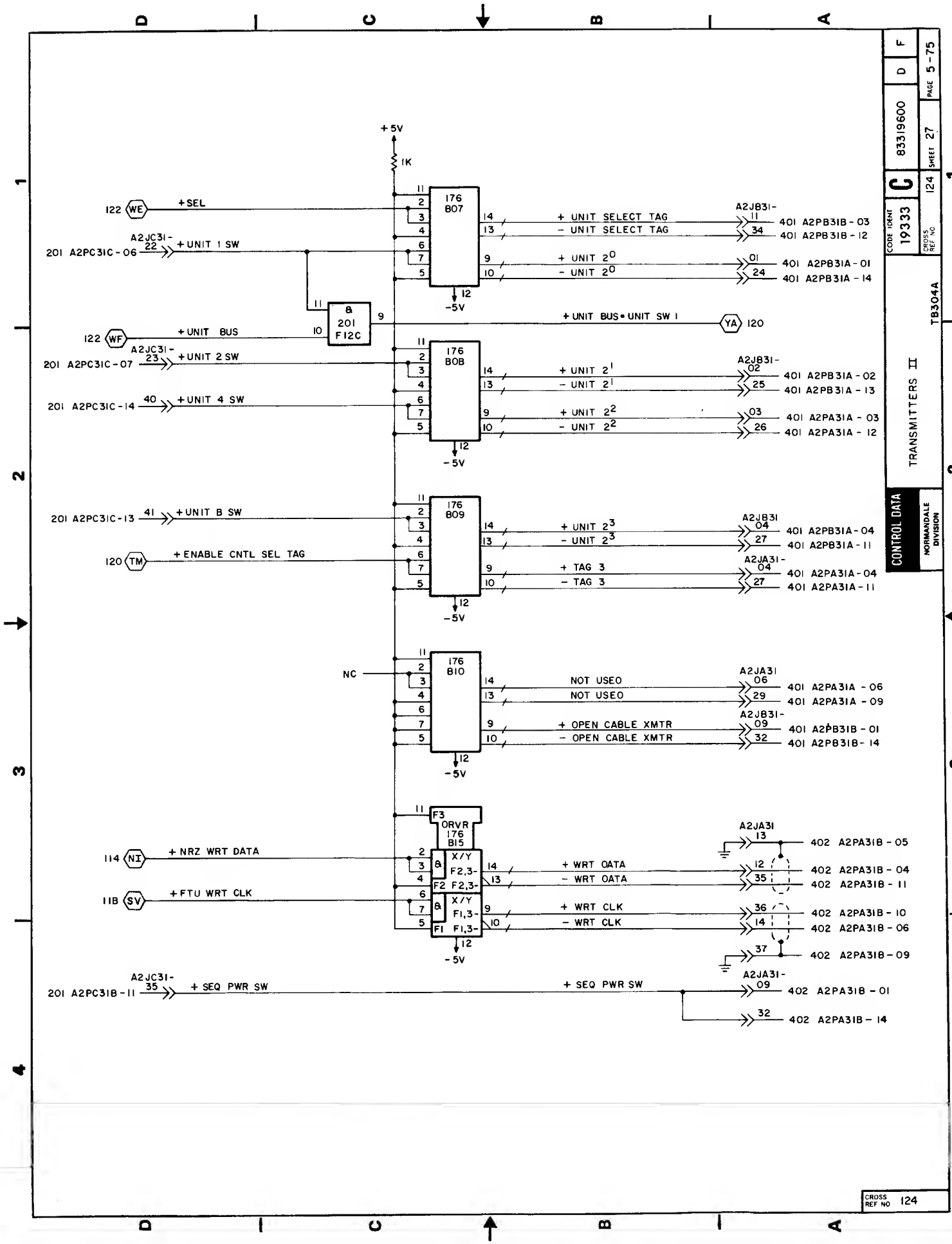


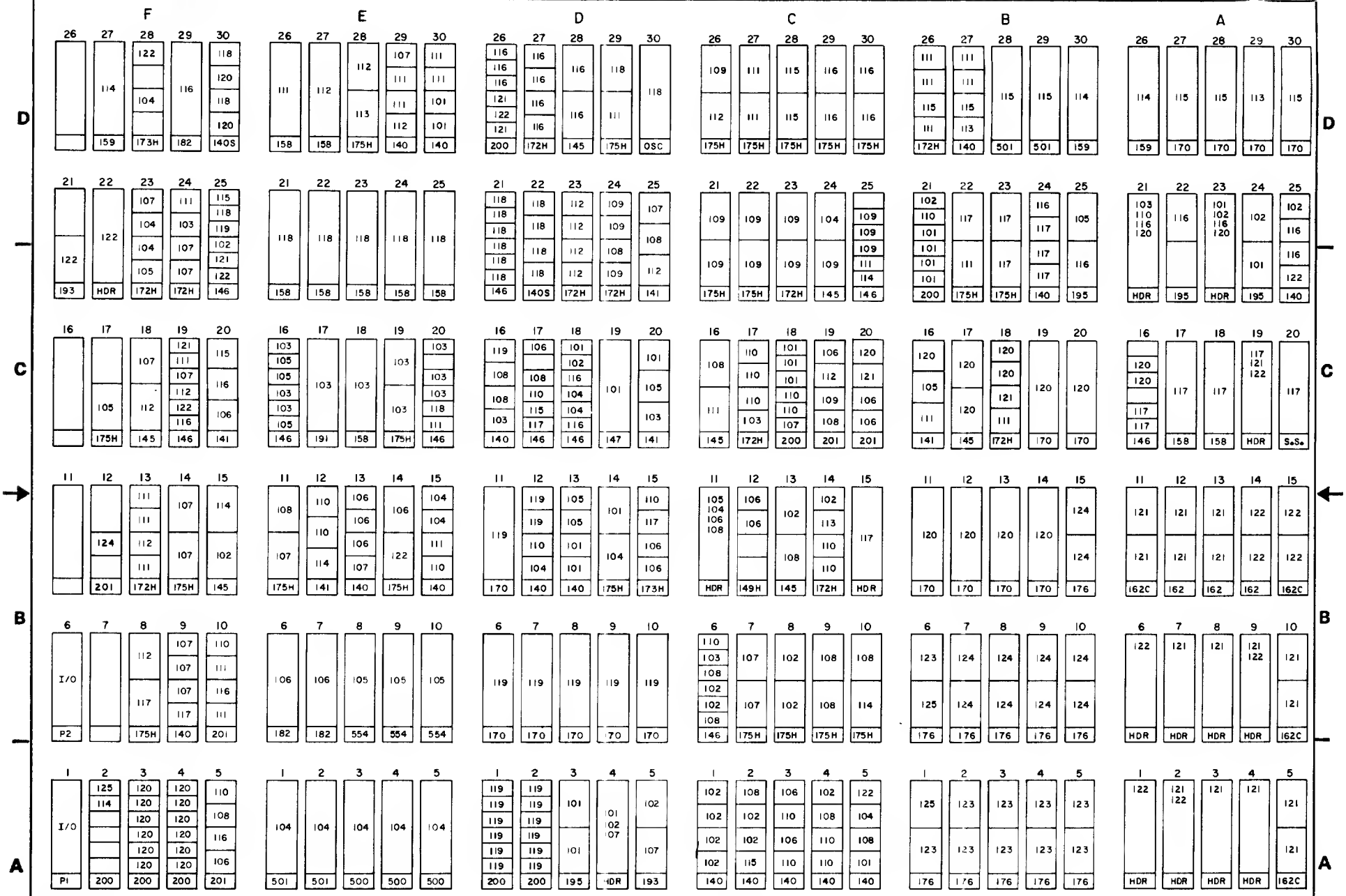
CONTROL DATA
NORMANDALE DIVISION

TRANSMITTERS I
TB304A

CODE IDENT 19333
CROSS REF NO 123
C
83319600
SHEET 26
PAGE 5-74
A
C

CROSS REF NO 123


+5V
1K
176 807
122 WE +SEL
A2JC31-22 +UNIT 1 SW
201 A2PC31C-06
+ UNIT SELECT TAG
- UNIT SELECT TAG
A2JB31-11 401 A2PB31B-03
34 401 A2PB31B-12
+ UNIT 2^0
- UNIT 2^0
01 401 A2PB31A-01
24 401 A2PB31A-14
-5V
8 201 F12C
+UNIT BUS=UNIT SW 1
YA 120
122 WF +UNIT BUS
176 B08
A2JC31-23 +UNIT 2 SW
201 A2PC31C-07
+ UNIT 2^1
- UNIT 2^1
02 401 A2PB31A-02
25 401 A2PB31A-13
A2JC31-40 +UNIT 4 SW
201 A2PC31C-14
+ UNIT 2^2
- UNIT 2^2
03 401 A2PA31A-03
26 401 A2PA31A-12
176 B09
A2JC31-41 +UNIT B SW
201 A2PC31C-13
+ UNIT 2^3
- UNIT 2^3
A2JB31 04 401 A2PB31A-04
27 401 A2PB31A-11
120 TM +ENABLE CNTL SEL TAG
+ TAG 3
- TAG 3
A2JA31-04 401 A2PA31A-04
27 401 A2PA31A-11
176 B10
NC
NOT USED
NOT USED
A2JA31 06 401 A2PA31A-06
29 401 A2PA31A-09
+ OPEN CABLE XMTR
- OPEN CABLE XMTR
A2JB31-09 401 A2PB31B-01
32 401 A2PB31B-14
F3 ORVR 176 B15
X/Y F2,3-
F2 F2,3-
X/Y F1,3-
F1 F1,3-
114 NI +NRZ WRT DATA
118 SV +FTU WRT CLK
+ WRT DATA
- WRT DATA
+ WRT CLK
- WRT CLK
A2JA31 13 402 A2PA31B-05
12 402 A2PA31B-04
35 402 A2PA31B-11
36 402 A2PA31B-10
14 402 A2PA31B-06
37 402 A2PA31B-09
A2JC31-35 +SEQ PWR SW
201 A2PC31B-11
+ SEQ PWR SW
A2JA31-09 402 A2PA31B-01
32 402 A2PA31B-14
CONTROL DATA
NORMANDALE DIVISION
TRANSMITTERS II
TB3044A
CODE IDENT 19333
C
83319600
D
F
SHEET 27
PAGE 5-75
CROSS REF NO 124
CROSS REF NO 124

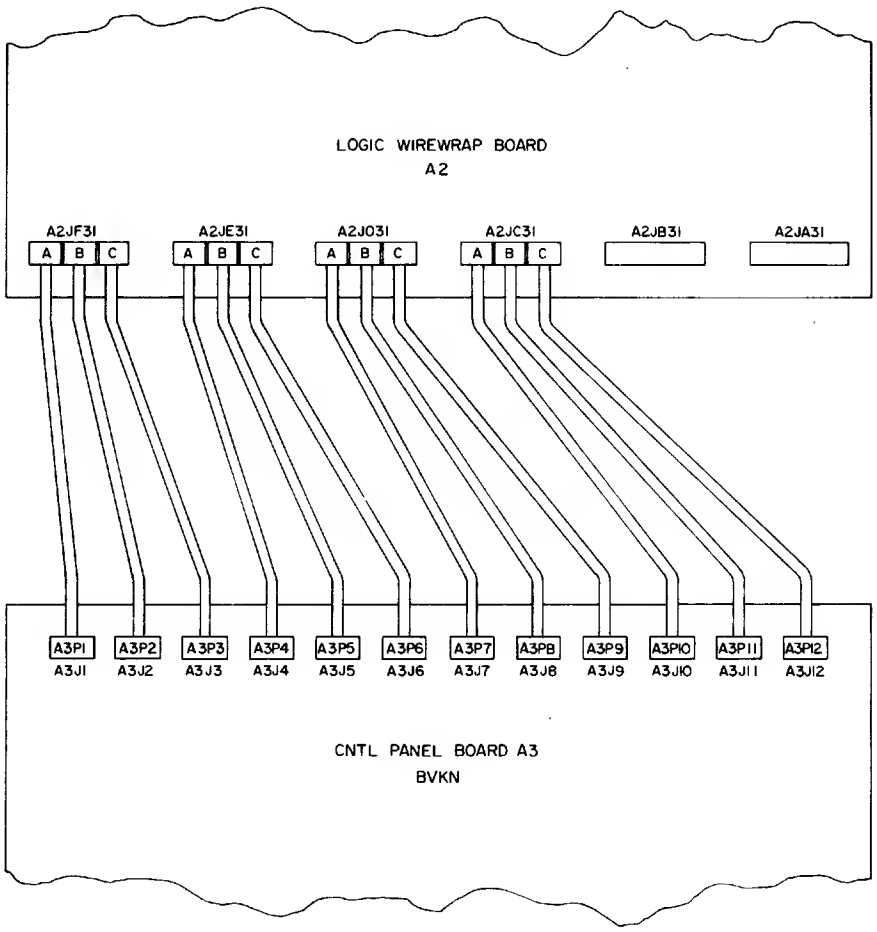


CROSS REF NO 125

NOTES

1. BOTTOM DESIGNATION IN EACH LOCATION IS I.C. TYPE; OTHER NUMBERS ARE LOGIC DIAGRAM CROSS-REFERENCE PAGES WHERE CIRCUIT SECTION IS SHOWN.
2. LOCATIONS OR I.C. SECTIONS THAT ARE UNUSED ARE LEFT BLANK
3. MISCELLANEOUS DESIGNATIONS:
   HDR = RESISTOR HEADER
   OSC = CRYSTAL OSCILLATOR
   S.S. = SECTOR SWITCHES (8)
   I/O = I/O BYPASS CONNECTOR

CONTROL DATA	LOGIC BOARD I.C. PLACEMENT	CODE IDENT 19333	C	83319600	D	F
NORMANDALE DIVISION	T8304A	CROSS REF NO 125		SHEET 28	PAGE 5-76	



NOTE:

1 NO ATTEMPT IS MAOE TO SHOW DIRECTION OF SIGNAL FLOW IN OR OUT OF THE PLUGS. THIS IS OETERMINEO BY REFERRING TO SHEETS CONTAINING JACK CONNECTIONS

CONTROL DATA
NORMANDALE DIVISION

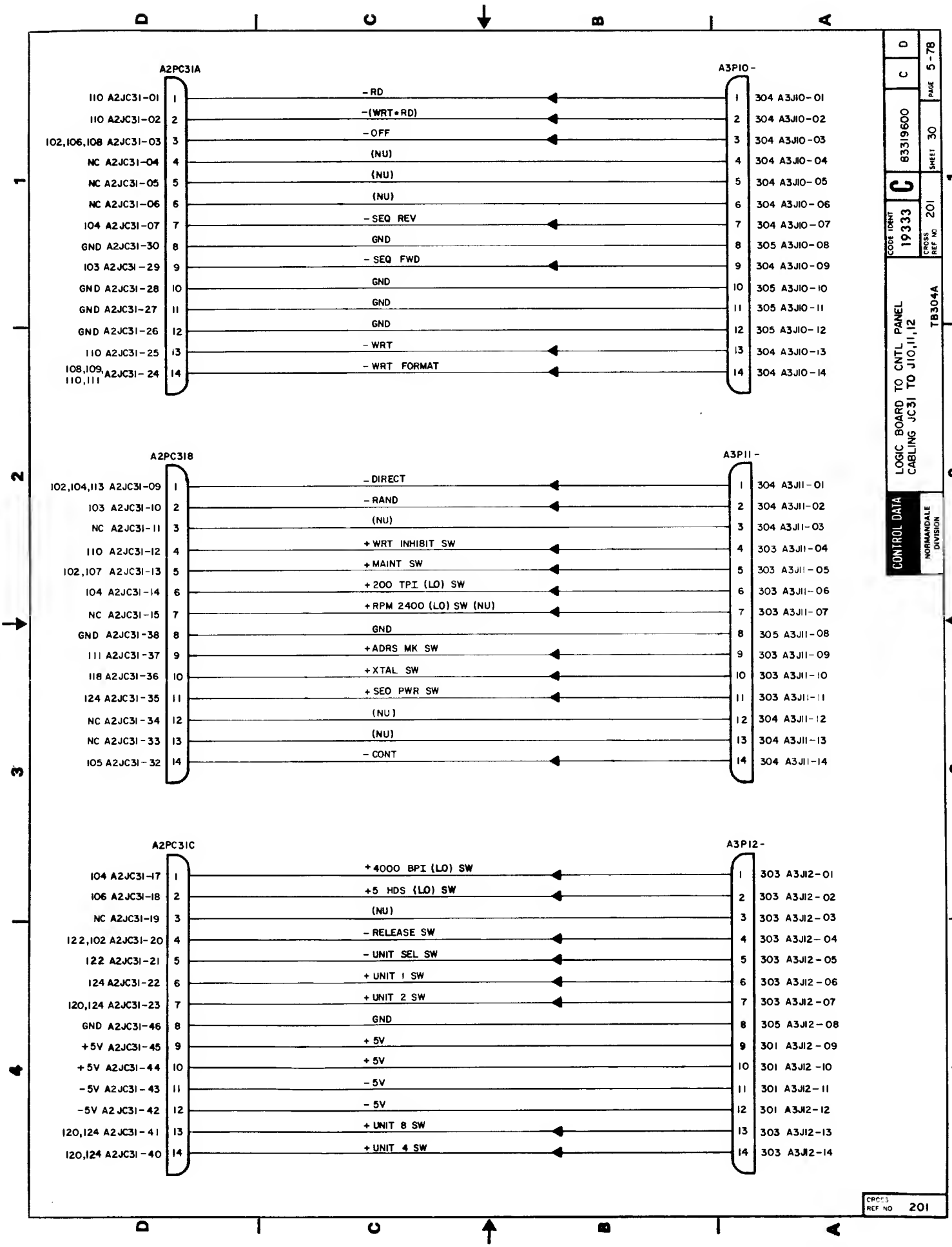
LOGIC BOARD TO CONTROL PANEL CABLING

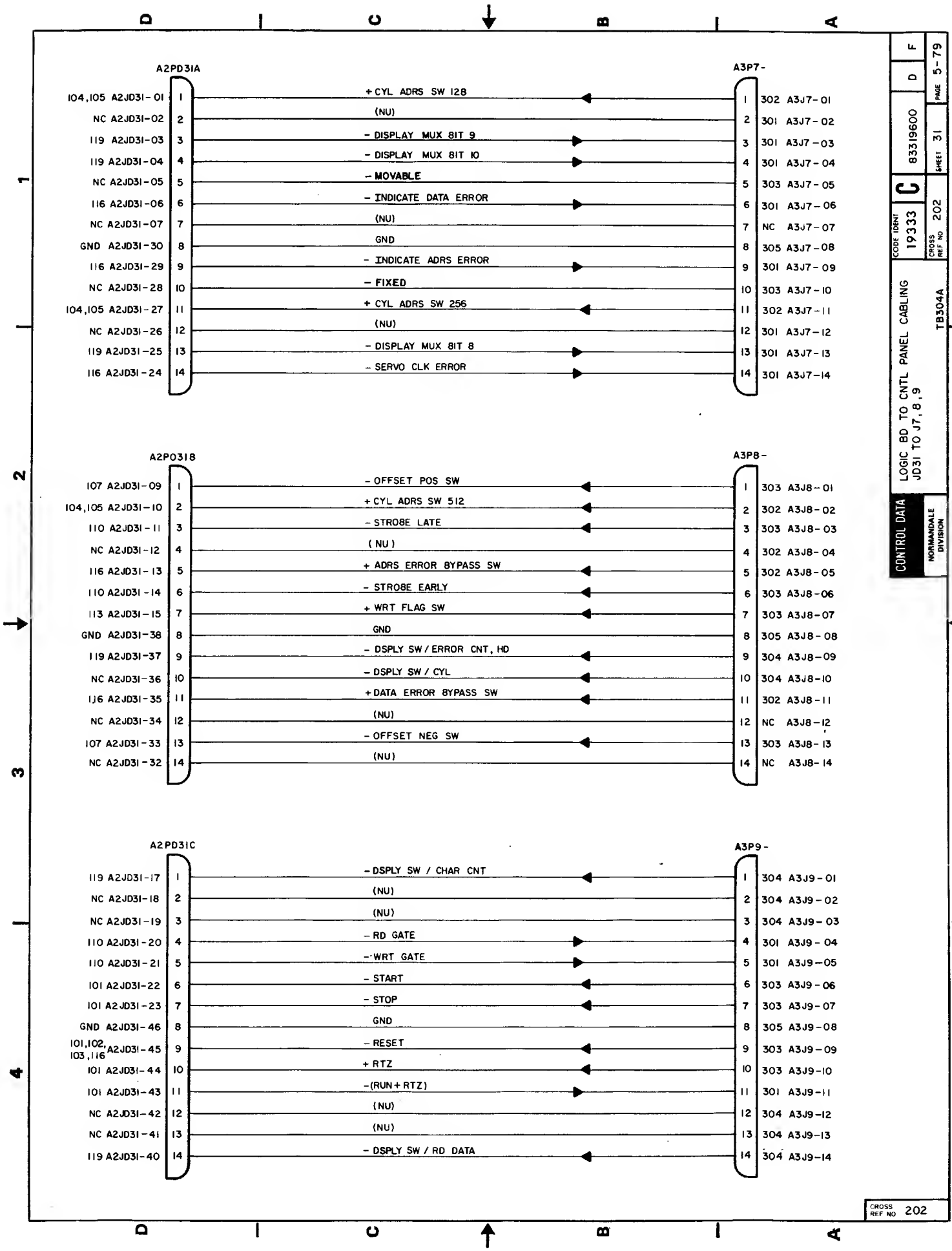
TB304A

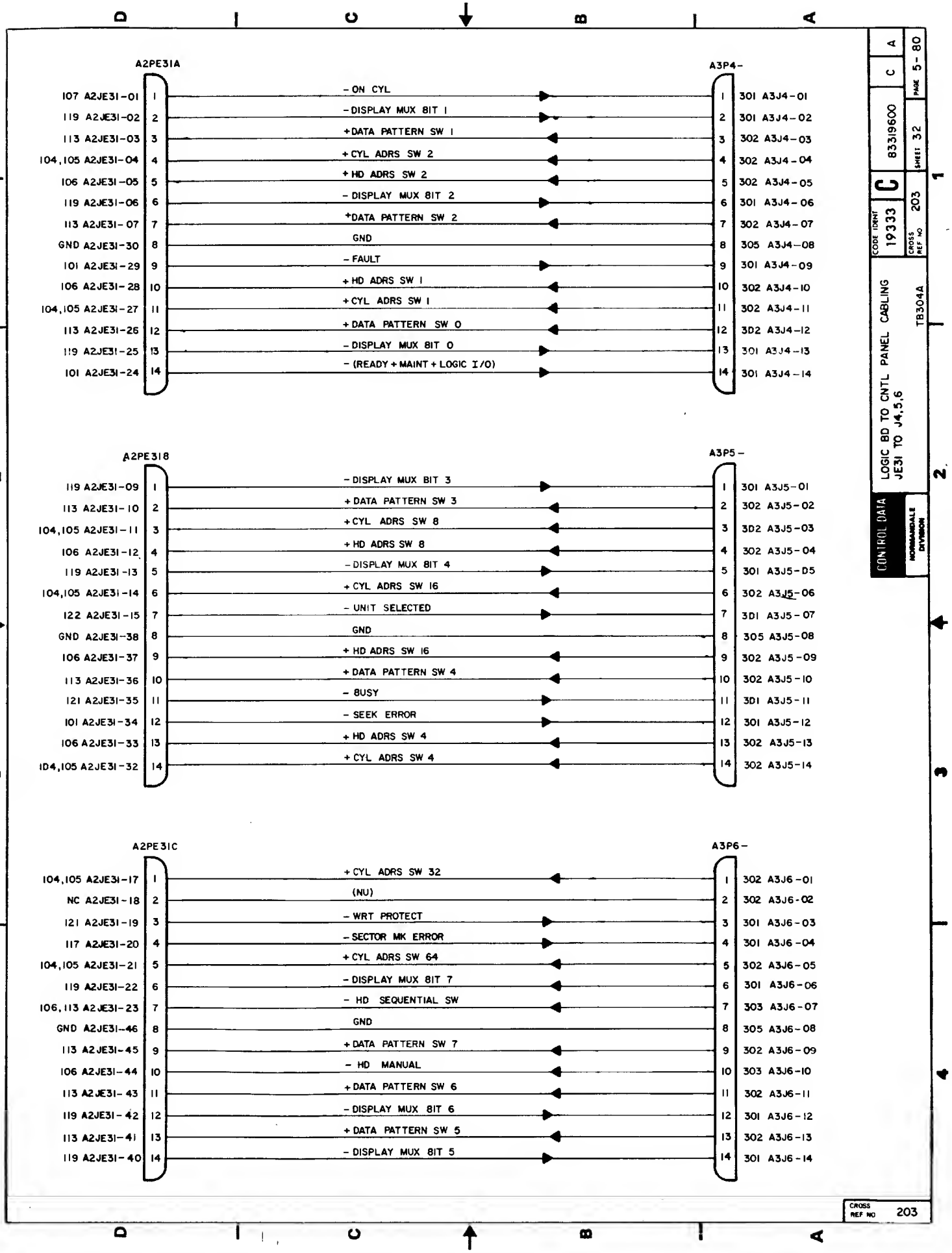
CODE IDENT 19333 | C | 83319600 | C | A

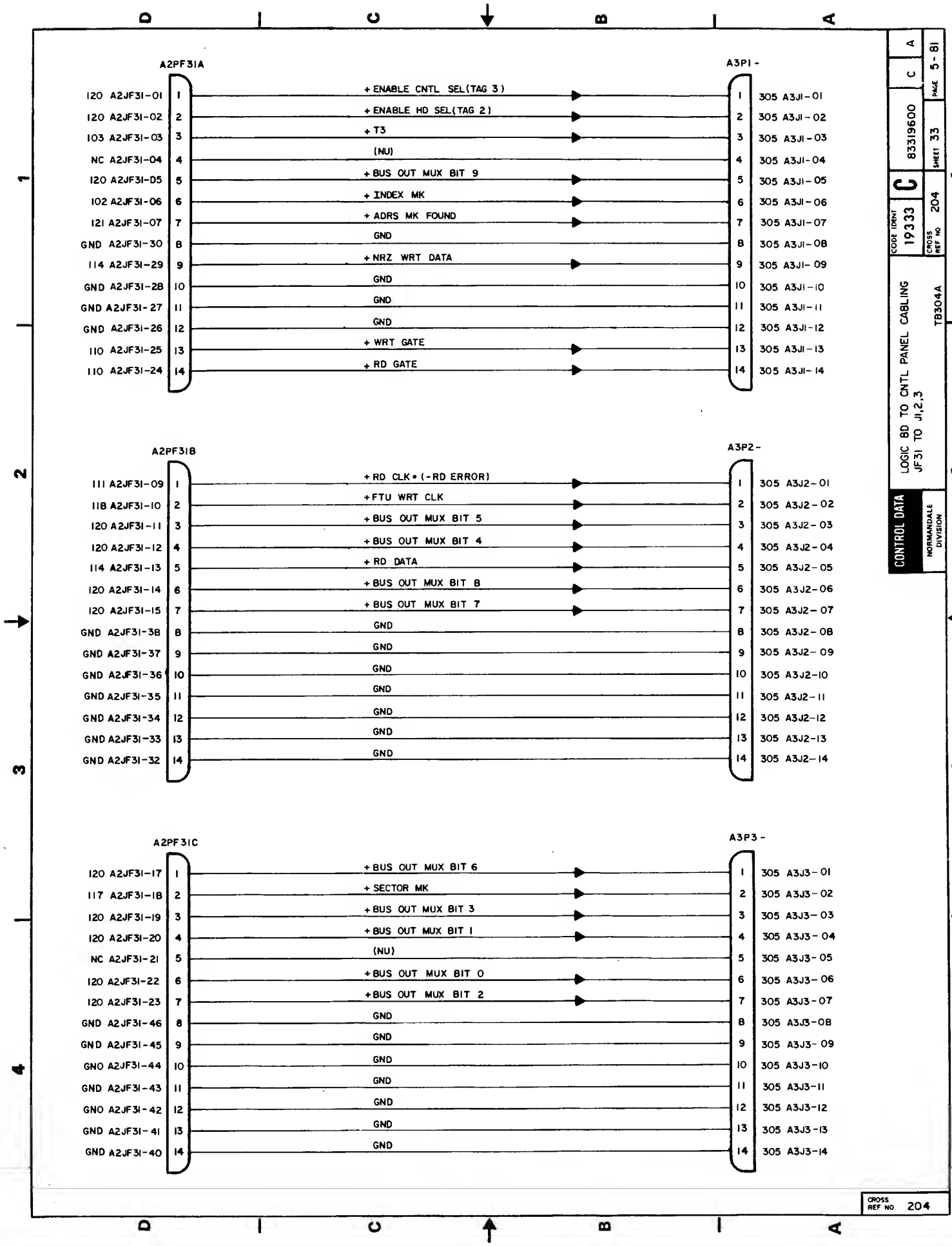
CROSS REF NO 200 | SHEET 29 | PAGE 5-77

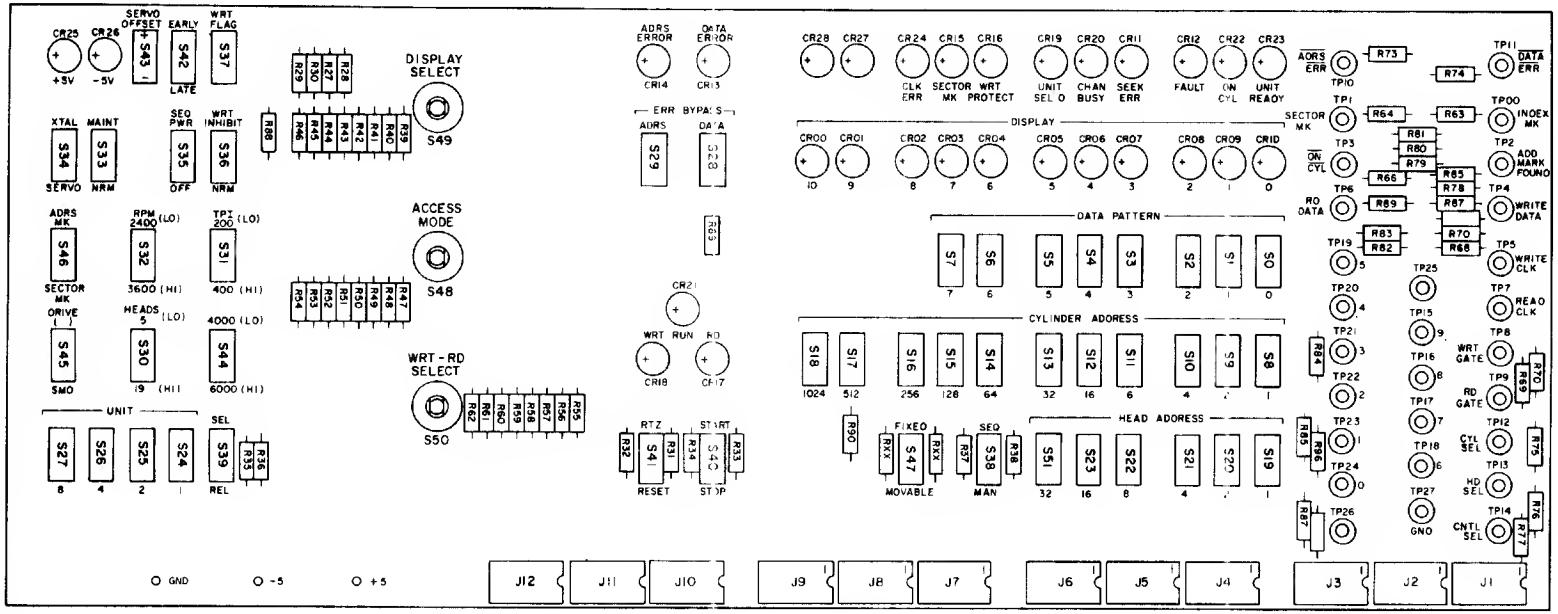
CROSS REF NO 200


A2PC31A
A3PI0-
110 A2JC31-01 1 - RD 1 304 A3JI0-01
110 A2JC31-02 2 -(WRT•RD) 2 304 A3JI0-02
102,106,108 A2JC31-03 3 - OFF 3 304 A3JI0-03
NC A2JC31-04 4 (NU) 4 304 A3JI0-04
NC A2JC31-05 5 (NU) 5 304 A3JI0-05
NC A2JC31-06 6 (NU) 6 304 A3JI0-06
104 A2JC31-07 7 - SEQ REV 7 304 A3JI0-07
GND A2JC31-30 8 GND 8 305 A3JI0-08
103 A2JC31-29 9 - SEQ FWD 9 304 A3JI0-09
GND A2JC31-28 10 GND 10 305 A3JI0-10
GND A2JC31-27 11 GND 11 305 A3JI0-11
GND A2JC31-26 12 GND 12 305 A3JI0-12
110 A2JC31-25 13 - WRT 13 304 A3JI0-13
108,109, 110,111 A2JC31-24 14 - WRT FORMAT 14 304 A3JI0-14
A2PC31B
A3PII-
102,104,113 A2JC31-09 1 - DIRECT 1 304 A3JI1-01
103 A2JC31-10 2 - RAND 2 304 A3JI1-02
NC A2JC31-11 3 (NU) 3 304 A3JI1-03
110 A2JC31-12 4 + WRT INHIBIT SW 4 303 A3JI1-04
102,107 A2JC31-13 5 + MAINT SW 5 303 A3JI1-05
104 A2JC31-14 6 + 200 TPI (LO) SW 6 303 A3JI1-06
NC A2JC31-15 7 + RPM 2400 (LO) SW (NU) 7 303 A3JI1-07
GND A2JC31-38 8 GND 8 305 A3JI1-08
111 A2JC31-37 9 + ADRS MK SW 9 303 A3JI1-09
118 A2JC31-36 10 + XTAL SW 10 303 A3JI1-10
124 A2JC31-35 11 + SEO PWR SW 11 303 A3JI1-11
NC A2JC31-34 12 (NU) 12 304 A3JI1-12
NC A2JC31-33 13 (NU) 13 304 A3JI1-13
105 A2JC31-32 14 - CONT 14 304 A3JI1-14
A2PC31C
A3PI2-
104 A2JC31-17 1 + 4000 BPI (LO) SW 1 303 A3JI2-01
106 A2JC31-18 2 + 5 HDS (LO) SW 2 303 A3JI2-02
NC A2JC31-19 3 (NU) 3 303 A3JI2-03
122,102 A2JC31-20 4 - RELEASE SW 4 303 A3JI2-04
122 A2JC31-21 5 - UNIT SEL SW 5 303 A3JI2-05
124 A2JC31-22 6 + UNIT 1 SW 6 303 A3JI2-06
120,124 A2JC31-23 7 + UNIT 2 SW 7 303 A3JI2-07
GND A2JC31-46 8 GND 8 305 A3JI2-08
+5V A2JC31-45 9 + 5V 9 301 A3JI2-09
+5V A2JC31-44 10 + 5V 10 301 A3JI2-10
-5V A2JC31-43 11 - 5V 11 301 A3JI2-11
-5V A2JC31-42 12 - 5V 12 301 A3JI2-12
120,124 A2JC31-41 13 + UNIT 8 SW 13 303 A3JI2-13
120,124 A2JC31-40 14 + UNIT 4 SW 14 303 A3JI2-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BOARD TO CNTL PANEL CABLING JC31 TO J10,11,12
TB304A
CODE IDENT 19333
C
83319600
D
C
PAGE 5-78
SHEET 30
CROSS REF NO 201
CROSS REF NO 201


A2PD31A
A3P7-
104,105 A2JD31-01 1 + CYL ADRS SW 128 1 302 A3J7-01
NC A2JD31-02 2 (NU) 2 301 A3J7-02
119 A2JD31-03 3 - DISPLAY MUX BIT 9 3 301 A3J7-03
119 A2JD31-04 4 - DISPLAY MUX BIT 10 4 301 A3J7-04
NC A2JD31-05 5 - MOVABLE 5 303 A3J7-05
116 A2JD31-06 6 - INDICATE DATA ERROR 6 301 A3J7-06
NC A2JD31-07 7 (NU) 7 NC A3J7-07
GND A2JD31-30 8 GND 8 305 A3J7-08
116 A2JD31-29 9 - INDICATE ADRS ERROR 9 301 A3J7-09
NC A2JD31-28 10 - FIXED 10 303 A3J7-10
104,105 A2JD31-27 11 + CYL ADRS SW 256 11 302 A3J7-11
NC A2JD31-26 12 (NU) 12 301 A3J7-12
119 A2JD31-25 13 - DISPLAY MUX BIT 8 13 301 A3J7-13
116 A2JD31-24 14 - SERVO CLK ERROR 14 301 A3J7-14
A2PD31B
A3P8-
107 A2JD31-09 1 - OFFSET POS SW 1 303 A3J8-01
104,105 A2JD31-10 2 + CYL ADRS SW 512 2 302 A3J8-02
110 A2JD31-11 3 - STROBE LATE 3 303 A3J8-03
NC A2JD31-12 4 (NU) 4 302 A3J8-04
116 A2JD31-13 5 + ADRS ERROR BYPASS SW 5 302 A3J8-05
110 A2JD31-14 6 - STROBE EARLY 6 303 A3J8-06
113 A2JD31-15 7 + WRT FLAG SW 7 303 A3J8-07
GND A2JD31-38 8 GND 8 305 A3J8-08
119 A2JD31-37 9 - DSPLY SW/ERROR CNT, HD 9 304 A3J8-09
NC A2JD31-36 10 - DSPLY SW/CYL 10 304 A3J8-10
116 A2JD31-35 11 + DATA ERROR BYPASS SW 11 302 A3J8-11
NC A2JD31-34 12 (NU) 12 NC A3J8-12
107 A2JD31-33 13 - OFFSET NEG SW 13 303 A3J8-13
NC A2JD31-32 14 (NU) 14 NC A3J8-14
A2PD31C
A3P9-
119 A2JD31-17 1 - DSPLY SW / CHAR CNT 1 304 A3J9-01
NC A2JD31-18 2 (NU) 2 304 A3J9-02
NC A2JD31-19 3 (NU) 3 304 A3J9-03
110 A2JD31-20 4 - RD GATE 4 301 A3J9-04
110 A2JD31-21 5 - WRT GATE 5 301 A3J9-05
101 A2JD31-22 6 - START 6 303 A3J9-06
101 A2JD31-23 7 - STOP 7 303 A3J9-07
GND A2JD31-46 8 GND 8 305 A3J9-08
101,102,103,116 A2JD31-45 9 - RESET 9 303 A3J9-09
101 A2JD31-44 10 + RTZ 10 303 A3J9-10
101 A2JD31-43 11 -(RUN+RTZ) 11 301 A3J9-11
NC A2JD31-42 12 (NU) 12 304 A3J9-12
NC A2JD31-41 13 (NU) 13 304 A3J9-13
119 A2JD31-40 14 - DSPLY SW / RD DATA 14 304 A3J9-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BD TO CNTL PANEL CABLING
JD31 TO J7,8,9
TB304A
CODE IDENT 19333
C
83319600
D
F
PAGE 5-79
SHEET 31
CROSS REF NO 202
CROSS REF NO 202

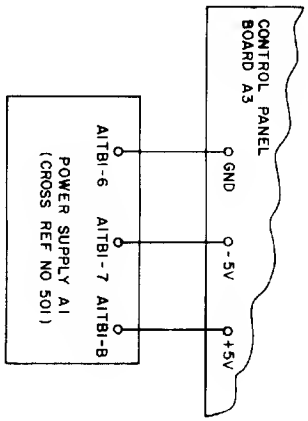

A2PE31A
A3P4-
107 A2JE31-01 1 - ON CYL 1 301 A3J4-01
119 A2JE31-02 2 - DISPLAY MUX BIT 1 2 301 A3J4-02
113 A2JE31-03 3 + DATA PATTERN SW 1 3 302 A3J4-03
104,105 A2JE31-04 4 + CYL ADRS SW 2 4 302 A3J4-04
106 A2JE31-05 5 + HD ADRS SW 2 5 302 A3J4-05
119 A2JE31-06 6 - DISPLAY MUX BIT 2 6 301 A3J4-06
113 A2JE31-07 7 + DATA PATTERN SW 2 7 302 A3J4-07
GND A2JE31-30 8 GND 8 305 A3J4-08
101 A2JE31-29 9 - FAULT 9 301 A3J4-09
106 A2JE31-28 10 + HD ADRS SW 1 10 302 A3J4-10
104,105 A2JE31-27 11 + CYL ADRS SW 1 11 302 A3J4-11
113 A2JE31-26 12 + DATA PATTERN SW 0 12 302 A3J4-12
119 A2JE31-25 13 - DISPLAY MUX BIT 0 13 301 A3J4-13
101 A2JE31-24 14 - (READY + MAINT + LOGIC I/O) 14 301 A3J4-14
A2PE31B
A3P5-
119 A2JE31-09 1 - DISPLAY MUX BIT 3 1 301 A3J5-01
113 A2JE31-10 2 + DATA PATTERN SW 3 2 302 A3J5-02
104,105 A2JE31-11 3 + CYL ADRS SW 8 3 302 A3J5-03
106 A2JE31-12 4 + HD ADRS SW 8 4 302 A3J5-04
119 A2JE31-13 5 - DISPLAY MUX BIT 4 5 301 A3J5-05
104,105 A2JE31-14 6 + CYL ADRS SW 16 6 302 A3J5-06
122 A2JE31-15 7 - UNIT SELECTED 7 301 A3J5-07
GND A2JE31-38 8 GND 8 305 A3J5-08
106 A2JE31-37 9 + HD ADRS SW 16 9 302 A3J5-09
113 A2JE31-36 10 + DATA PATTERN SW 4 10 302 A3J5-10
121 A2JE31-35 11 - BUSY 11 301 A3J5-11
101 A2JE31-34 12 - SEEK ERROR 12 301 A3J5-12
106 A2JE31-33 13 + HD ADRS SW 4 13 302 A3J5-13
104,105 A2JE31-32 14 + CYL ADRS SW 4 14 302 A3J5-14
A2PE31C
A3P6-
104,105 A2JE31-17 1 + CYL ADRS SW 32 1 302 A3J6-01
NC A2JE31-18 2 (NU) 2 302 A3J6-02
121 A2JE31-19 3 - WRT PROTECT 3 301 A3J6-03
117 A2JE31-20 4 - SECTOR MK ERROR 4 301 A3J6-04
104,105 A2JE31-21 5 + CYL ADRS SW 64 5 302 A3J6-05
119 A2JE31-22 6 - DISPLAY MUX BIT 7 6 301 A3J6-06
106,113 A2JE31-23 7 - HD SEQUENTIAL SW 7 303 A3J6-07
GND A2JE31-46 8 GND 8 305 A3J6-08
113 A2JE31-45 9 + DATA PATTERN SW 7 9 302 A3J6-09
106 A2JE31-44 10 - HD MANUAL 10 303 A3J6-10
113 A2JE31-43 11 + DATA PATTERN SW 6 11 302 A3J6-11
119 A2JE31-42 12 - DISPLAY MUX BIT 6 12 301 A3J6-12
113 A2JE31-41 13 + DATA PATTERN SW 5 13 302 A3J6-13
119 A2JE31-40 14 - DISPLAY MUX BIT 5 14 301 A3J6-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC BD TO CNTL PANEL CABLING
JE31 TO J4,5,6
TB304A
CODE IDENT 19333
C
83319600
SHEET 32
PAGE 5-80
CROSS REF NO 203
A
C
CROSS REF NO 203


A2PF31A
A3P1-
120 A2JF31-01 1 + ENABLE CNTL SEL(TAG 3) 1 305 A3J1-01
120 A2JF31-02 2 + ENABLE HD SEL(TAG 2) 2 305 A3J1-02
103 A2JF31-03 3 + T3 3 305 A3J1-03
NC A2JF31-04 4 (NU) 4 305 A3J1-04
120 A2JF31-05 5 + BUS OUT MUX BIT 9 5 305 A3J1-05
102 A2JF31-06 6 + INDEX MK 6 305 A3J1-06
121 A2JF31-07 7 + ADRS MK FOUND 7 305 A3J1-07
GND A2JF31-30 8 GND 8 305 A3J1-08
114 A2JF31-29 9 + NRZ WRT DATA 9 305 A3J1-09
GND A2JF31-28 10 GND 10 305 A3J1-10
GND A2JF31-27 11 GND 11 305 A3J1-11
GND A2JF31-26 12 GND 12 305 A3J1-12
110 A2JF31-25 13 + WRT GATE 13 305 A3J1-13
110 A2JF31-24 14 + RD GATE 14 305 A3J1-14
A2PF31B
A3P2-
111 A2JF31-09 1 + RD CLK • (-RD ERROR) 1 305 A3J2-01
118 A2JF31-10 2 + FTU WRT CLK 2 305 A3J2-02
120 A2JF31-11 3 + BUS OUT MUX BIT 5 3 305 A3J2-03
120 A2JF31-12 4 + BUS OUT MUX BIT 4 4 305 A3J2-04
114 A2JF31-13 5 + RD DATA 5 305 A3J2-05
120 A2JF31-14 6 + BUS OUT MUX BIT 8 6 305 A3J2-06
120 A2JF31-15 7 + BUS OUT MUX BIT 7 7 305 A3J2-07
GND A2JF31-38 8 GND 8 305 A3J2-08
GND A2JF31-37 9 GND 9 305 A3J2-09
GND A2JF31-36 10 GND 10 305 A3J2-10
GND A2JF31-35 11 GND 11 305 A3J2-11
GND A2JF31-34 12 GND 12 305 A3J2-12
GND A2JF31-33 13 GND 13 305 A3J2-13
GND A2JF31-32 14 GND 14 305 A3J2-14
A2PF31C
A3P3-
120 A2JF31-17 1 + BUS OUT MUX BIT 6 1 305 A3J3-01
117 A2JF31-18 2 + SECTOR MK 2 305 A3J3-02
120 A2JF31-19 3 + BUS OUT MUX BIT 3 3 305 A3J3-03
120 A2JF31-20 4 + BUS OUT MUX BIT 1 4 305 A3J3-04
NC A2JF31-21 5 (NU) 5 305 A3J3-05
120 A2JF31-22 6 + BUS OUT MUX BIT 0 6 305 A3J3-06
120 A2JF31-23 7 + BUS OUT MUX BIT 2 7 305 A3J3-07
GND A2JF31-46 8 GND 8 305 A3J3-08
GND A2JF31-45 9 GND 9 305 A3J3-09
GNO A2JF31-44 10 GND 10 305 A3J3-10
GND A2JF31-43 11 GND 11 305 A3J3-11
GNO A2JF31-42 12 GND 12 305 A3J3-12
GND A2JF31-41 13 GND 13 305 A3J3-13
GND A2JF31-40 14 GND 14 305 A3J3-14
CONTROL DATA
NORMANDALE DIVISION
LOGIC 8D TO CNTL PANEL CABLING
JF31 TO J1,2,3
TB304A
CODE IDENT 19333
C
83319600
A
C
PAGE 5-81
SHEET 33
CROSS REF NO 204
CROSS REF NO 204



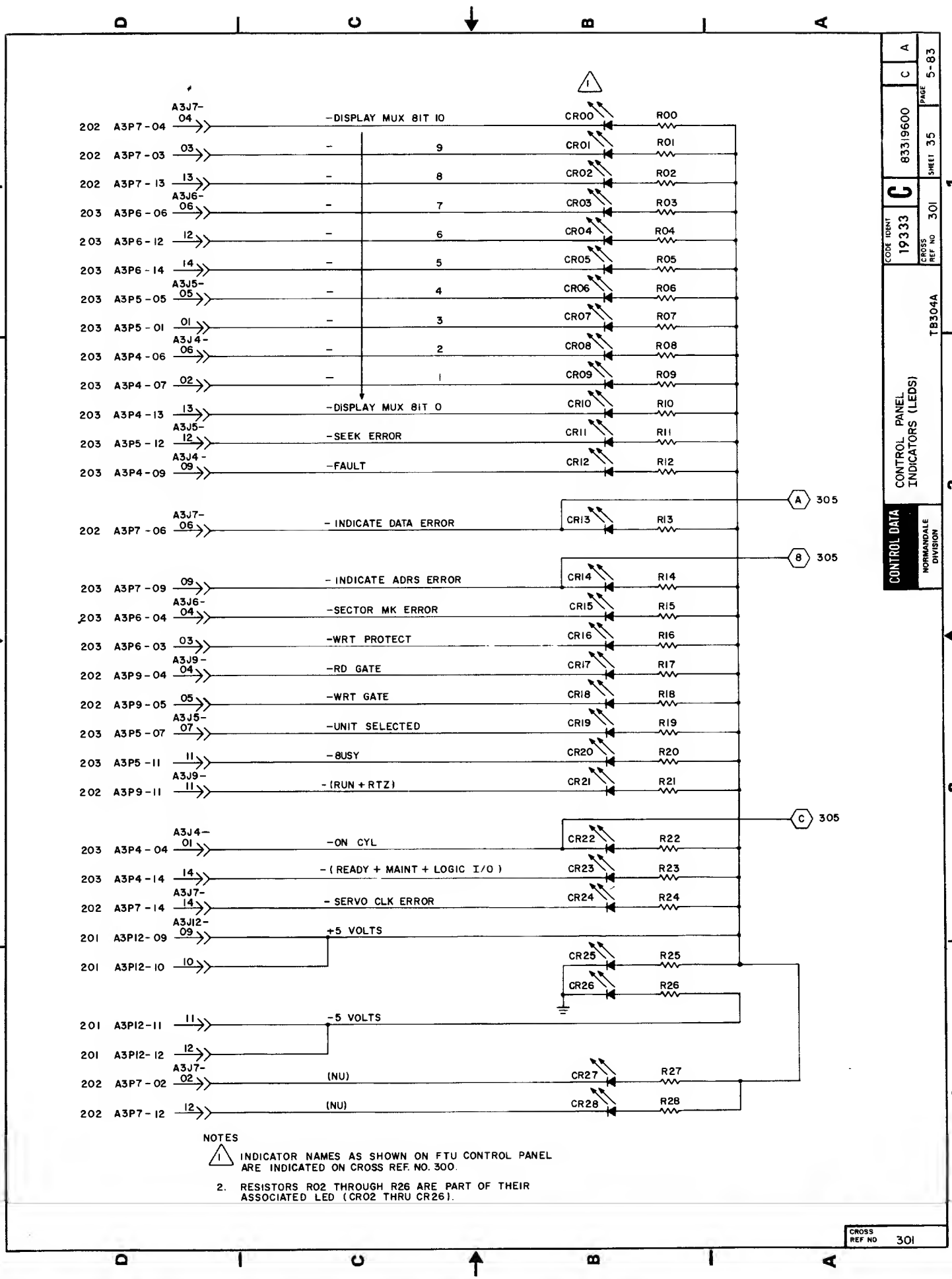
NOTES:

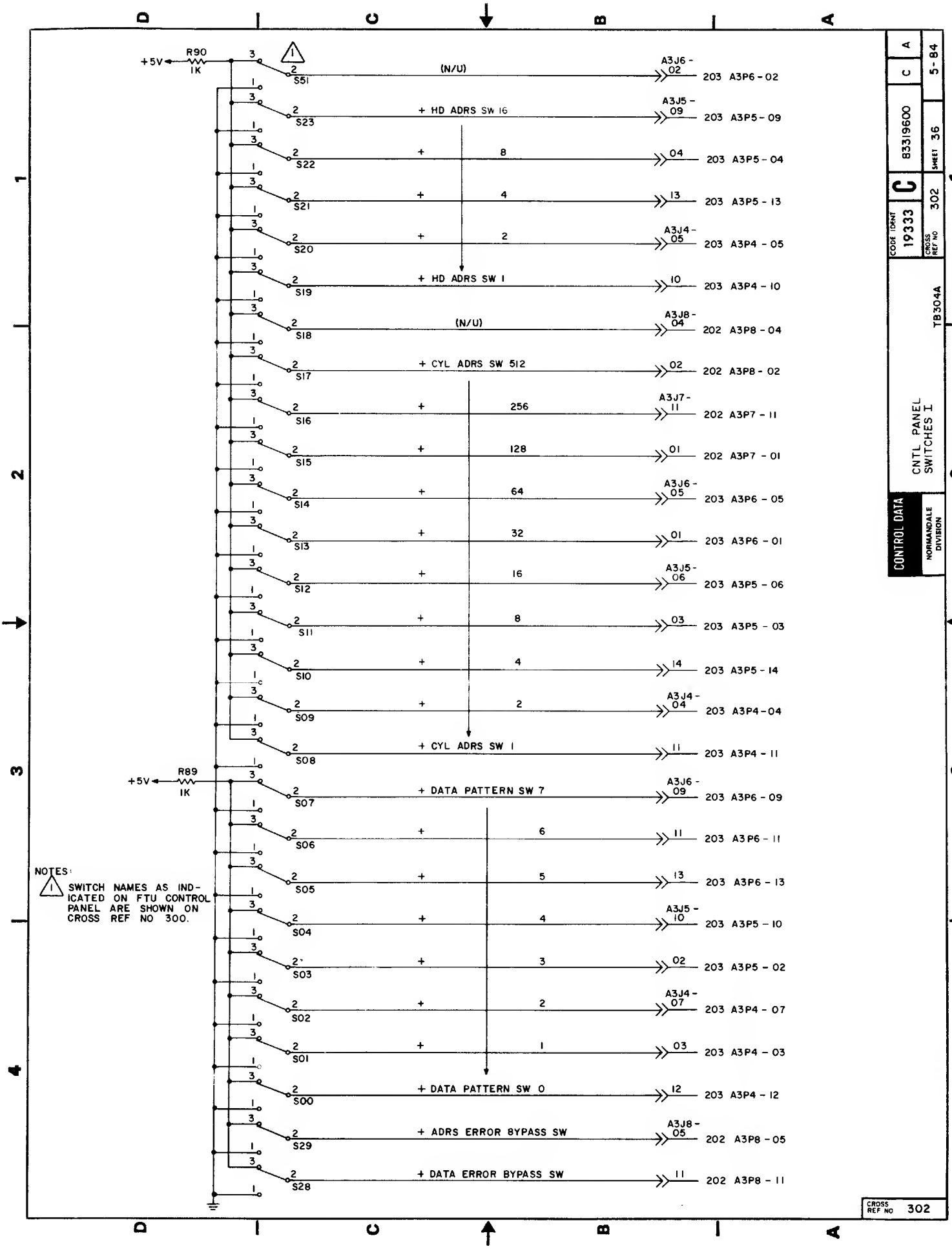
1. THESE ELEMENTS ARE NOT INSTALLED ON PC BOARD
2. RESISTORS R02 THRU R26 ARE PART OF THEIR ASSOCIATED LED (CR02 THRU CR26)
3. REFER TO CROSS REF NO 200 FOR CABLES CONNECTING CNTL PANEL TO LOGIC BOARD
4. POWER AND GROUND CONNECTIONS

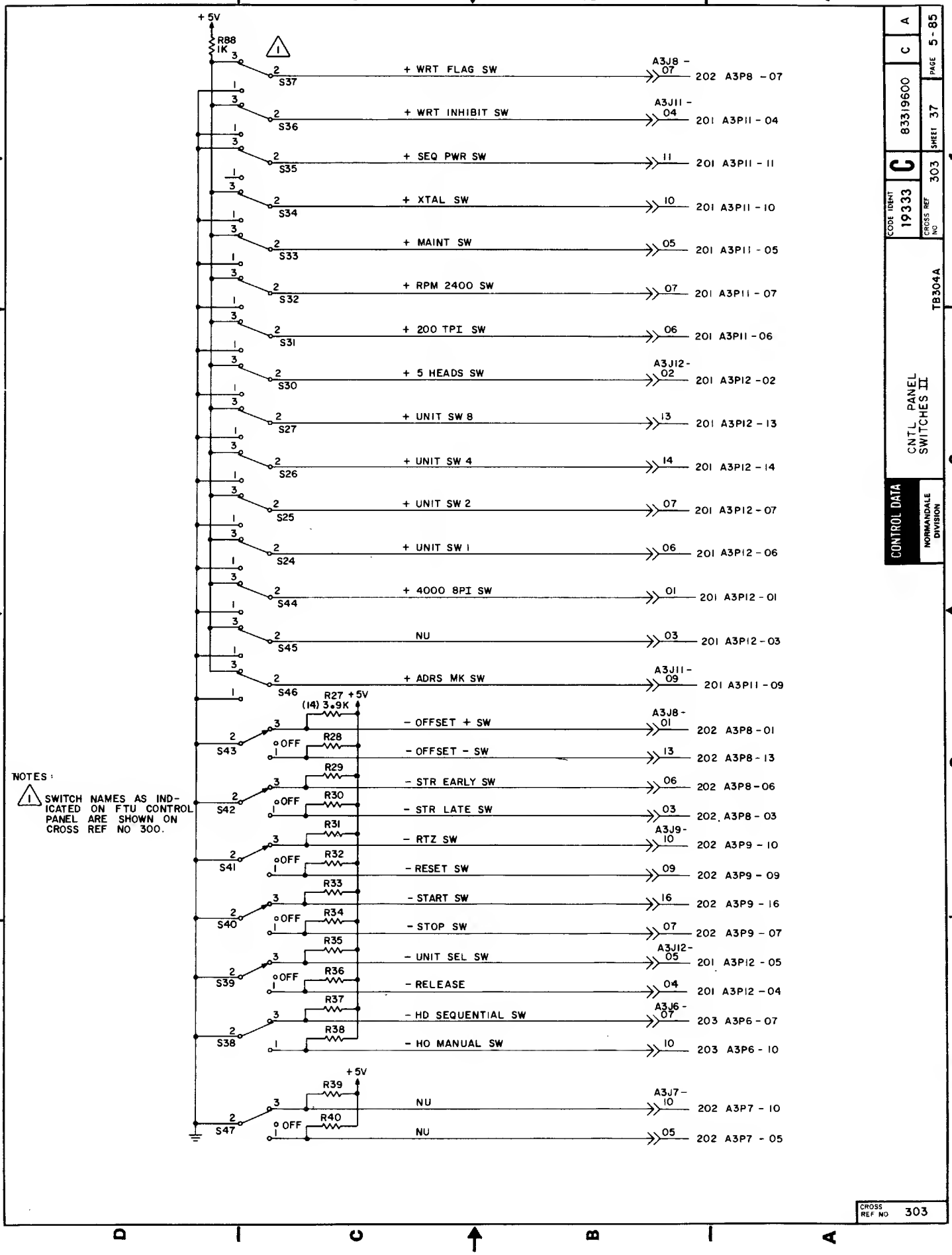


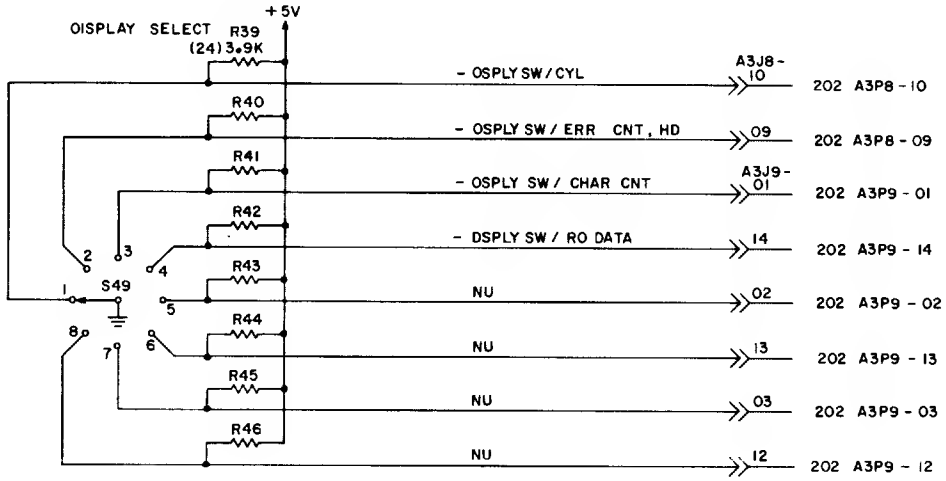
CROSS REF NO 300

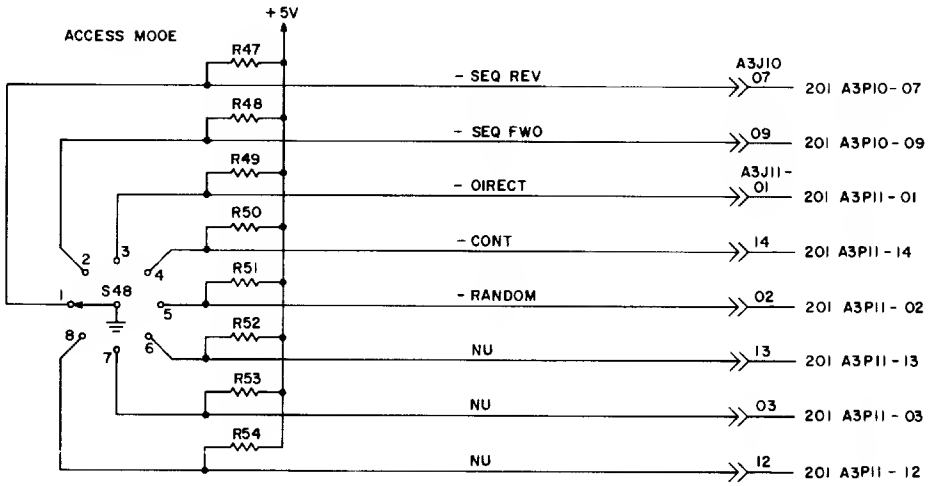
CONTROL DATA NORMANDALE DIVISION	CONTROL PANEL TB304A	CODE IDENT 19333	C	83319600	C A
		CROSS REF NO 300	SHEET 34	PAGE 5 - 82	

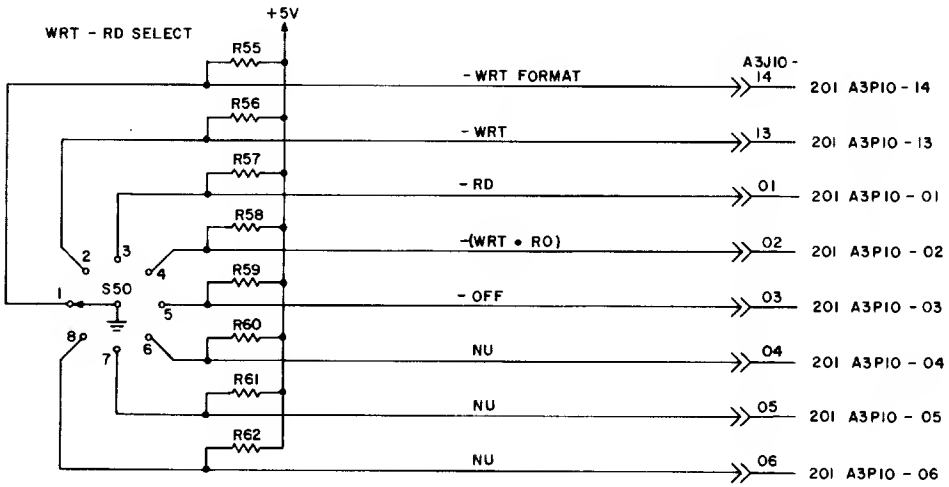

CONTROL DATA
NORMANDALE DIVISION
CONTROL PANEL INDICATORS (LEDS)
TB3304A
CODE IDENT 19333
C
83319600
SHEET 35
PAGE 5-83
CROSS REF NO 301
202 A3P7-04 A3J7-04 -DISPLAY MUX BIT 10 CR00 R00
202 A3P7-03 03 - 9 CR01 R01
202 A3P7-13 13 - 8 CR02 R02
203 A3P6-06 A3J6-06 - 7 CR03 R03
203 A3P6-12 12 - 6 CR04 R04
203 A3P6-14 14 - 5 CR05 R05
203 A3P5-05 A3J5-05 - 4 CR06 R06
203 A3P5-01 01 - 3 CR07 R07
203 A3P4-06 A3J4-06 - 2 CR08 R08
203 A3P4-07 02 - 1 CR09 R09
203 A3P4-13 13 -DISPLAY MUX BIT 0 CR10 R10
203 A3P5-12 A3J5-12 -SEEK ERROR CR11 R11
203 A3P4-09 A3J4-09 -FAULT CR12 R12
A 305
202 A3P7-06 A3J7-06 - INDICATE DATA ERROR CR13 R13
B 305
203 A3P7-09 09 - INDICATE ADRS ERROR CR14 R14
203 A3P6-04 A3J6-04 -SECTOR MK ERROR CR15 R15
203 A3P6-03 03 -WRT PROTECT CR16 R16
202 A3P9-04 A3J9-04 -RD GATE CR17 R17
202 A3P9-05 05 -WRT GATE CR18 R18
203 A3P5-07 A3J5-07 -UNIT SELECTED CR19 R19
203 A3P5-11 11 -BUSY CR20 R20
202 A3P9-11 A3J9-11 -(RUN + RTZ) CR21 R21
C 305
203 A3P4-04 A3J4-01 -ON CYL CR22 R22
203 A3P4-14 14 -(READY + MAINT + LOGIC I/O) CR23 R23
202 A3P7-14 A3J7-14 - SERVO CLK ERROR CR24 R24
201 A3P12-09 A3J12-09 +5 VOLTS
201 A3P12-10 10
CR25 R25
CR26 R26
201 A3P12-11 11 -5 VOLTS
201 A3P12-12 12
202 A3P7-02 A3J7-02 (NU) CR27 R27
202 A3P7-12 12 (NU) CR28 R28
NOTES
1 INDICATOR NAMES AS SHOWN ON FTU CONTROL PANEL ARE INDICATED ON CROSS REF. NO. 300.
2. RESISTORS R02 THROUGH R26 ARE PART OF THEIR ASSOCIATED LED (CR02 THRU CR26).
CROSS REF NO 301


+5V
R90
1K
S51
(N/U)
A3J6 - 02
203 A3P6 - 02
S23
+ HD ADRS SW 16
A3J5 - 09
203 A3P5 - 09
S22
+ 8
04
203 A3P5 - 04
S21
+ 4
13
203 A3P5 - 13
S20
+ 2
A3J4 - 05
203 A3P4 - 05
S19
+ HD ADRS SW 1
10
203 A3P4 - 10
S18
(N/U)
A3J8 - 04
202 A3P8 - 04
S17
+ CYL ADRS SW 512
02
202 A3P8 - 02
S16
+ 256
A3J7 - 11
202 A3P7 - 11
S15
+ 128
01
202 A3P7 - 01
S14
+ 64
A3J6 - 05
203 A3P6 - 05
S13
+ 32
01
203 A3P6 - 01
S12
+ 16
A3J5 - 06
203 A3P5 - 06
S11
+ 8
03
203 A3P5 - 03
S10
+ 4
14
203 A3P5 - 14
S09
+ 2
A3J4 - 04
203 A3P4 - 04
S08
+ CYL ADRS SW 1
11
203 A3P4 - 11
+5V
R89
1K
S07
+ DATA PATTERN SW 7
A3J6 - 09
203 A3P6 - 09
S06
+ 6
11
203 A3P6 - 11
S05
+ 5
13
203 A3P6 - 13
S04
+ 4
A3J5 - 10
203 A3P5 - 10
S03
+ 3
02
203 A3P5 - 02
S02
+ 2
A3J4 - 07
203 A3P4 - 07
S01
+ 1
03
203 A3P4 - 03
S00
+ DATA PATTERN SW 0
12
203 A3P4 - 12
S29
+ ADRS ERROR BYPASS SW
A3J8 - 05
202 A3P8 - 05
S28
+ DATA ERROR BYPASS SW
11
202 A3P8 - 11
NOTES:
1. SWITCH NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.
CONTROL DATA
NORMANDALE DIVISION
CNTL PANEL SWITCHES I
TB304A
CODE IDENT 19333
C
83319600
A
C
5-84
SHEET 36
CROSS REF NO 302
CROSS REF NO 302


+5V
R88
1K
S37
+ WRT FLAG SW
A3J8 - 07
202 A3P8 - 07
S36
+ WRT INHIBIT SW
A3J11 - 04
201 A3P11 - 04
S35
+ SEQ PWR SW
11
201 A3P11 - 11
S34
+ XTAL SW
10
201 A3P11 - 10
S33
+ MAINT SW
05
201 A3P11 - 05
S32
+ RPM 2400 SW
07
201 A3P11 - 07
S31
+ 200 TPI SW
06
201 A3P11 - 06
S30
+ 5 HEADS SW
A3J12 - 02
201 A3P12 - 02
S27
+ UNIT SW 8
13
201 A3P12 - 13
S26
+ UNIT SW 4
14
201 A3P12 - 14
S25
+ UNIT SW 2
07
201 A3P12 - 07
S24
+ UNIT SW 1
06
201 A3P12 - 06
S44
+ 4000 BPI SW
01
201 A3P12 - 01
S45
NU
03
201 A3P12 - 03
S46
+ ADRS MK SW
A3J11 - 09
201 A3P11 - 09
R27 +5V
(14) 3.9K
S43
OFF
R28
- OFFSET + SW
A3J8 - 01
202 A3P8 - 01
- OFFSET - SW
13
202 A3P8 - 13
R29
S42
OFF
R30
- STR EARLY SW
06
202 A3P8 - 06
- STR LATE SW
03
202 A3P8 - 03
R31
S41
OFF
R32
- RTZ SW
A3J9 - 10
202 A3P9 - 10
- RESET SW
09
202 A3P9 - 09
R33
S40
OFF
R34
- START SW
16
202 A3P9 - 16
- STOP SW
07
202 A3P9 - 07
R35
S39
OFF
R36
- UNIT SEL SW
A3J12 - 05
201 A3P12 - 05
- RELEASE
04
201 A3P12 - 04
R37
S38
R38
- HD SEQUENTIAL SW
A3J6 - 07
203 A3P6 - 07
- HD MANUAL SW
10
203 A3P6 - 10
+5V
R39
S47
OFF
R40
NU
A3J7 - 10
202 A3P7 - 10
NU
05
202 A3P7 - 05
NOTES:
1 SWITCH NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.
CONTROL DATA
NORMANDALE DIVISION
CNTL PANEL SWITCHES II
TB304A
CODE IDENT 19333
C
CROSS REF NO 303
83319600
SHEET 37
PAGE 5-85
A
C
CROSS REF NO 303

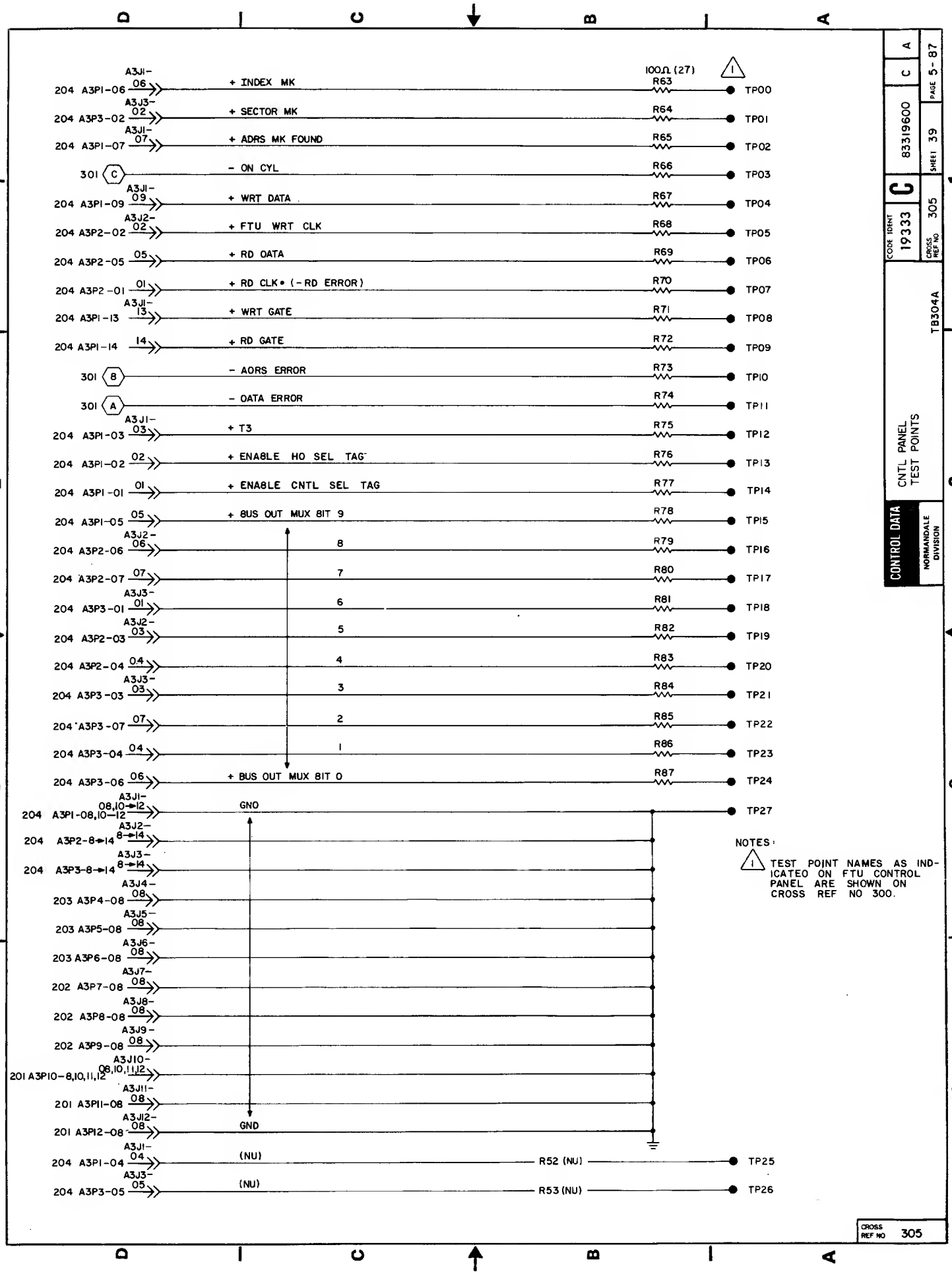


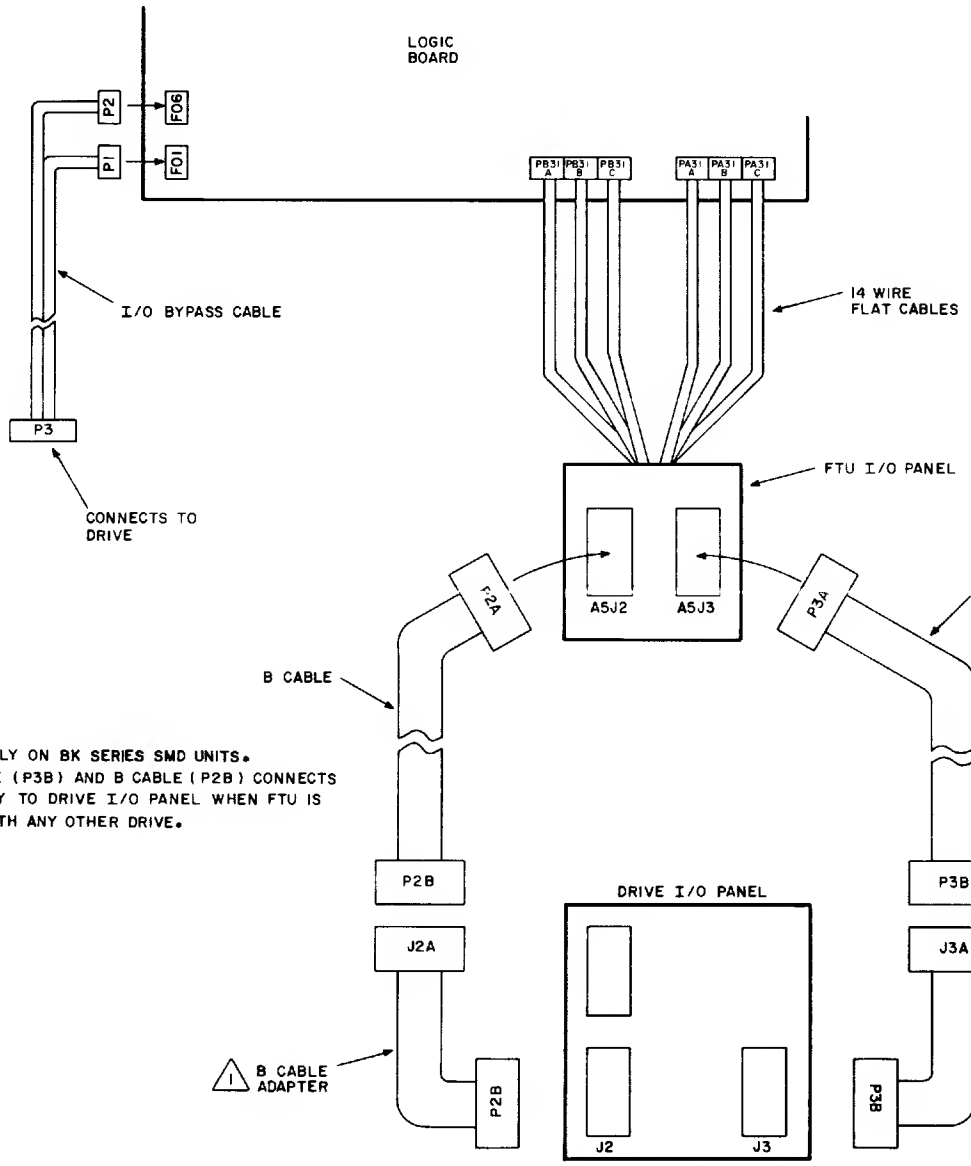




CONTROL DATA
NORMANDALE DIVISION
CNTL PANEL SWITCHES III
TB304A
CODE IDENT 19333
C
83319600
D
F
SHEET 38
PAGE 5-86
CROSS REF NO 304

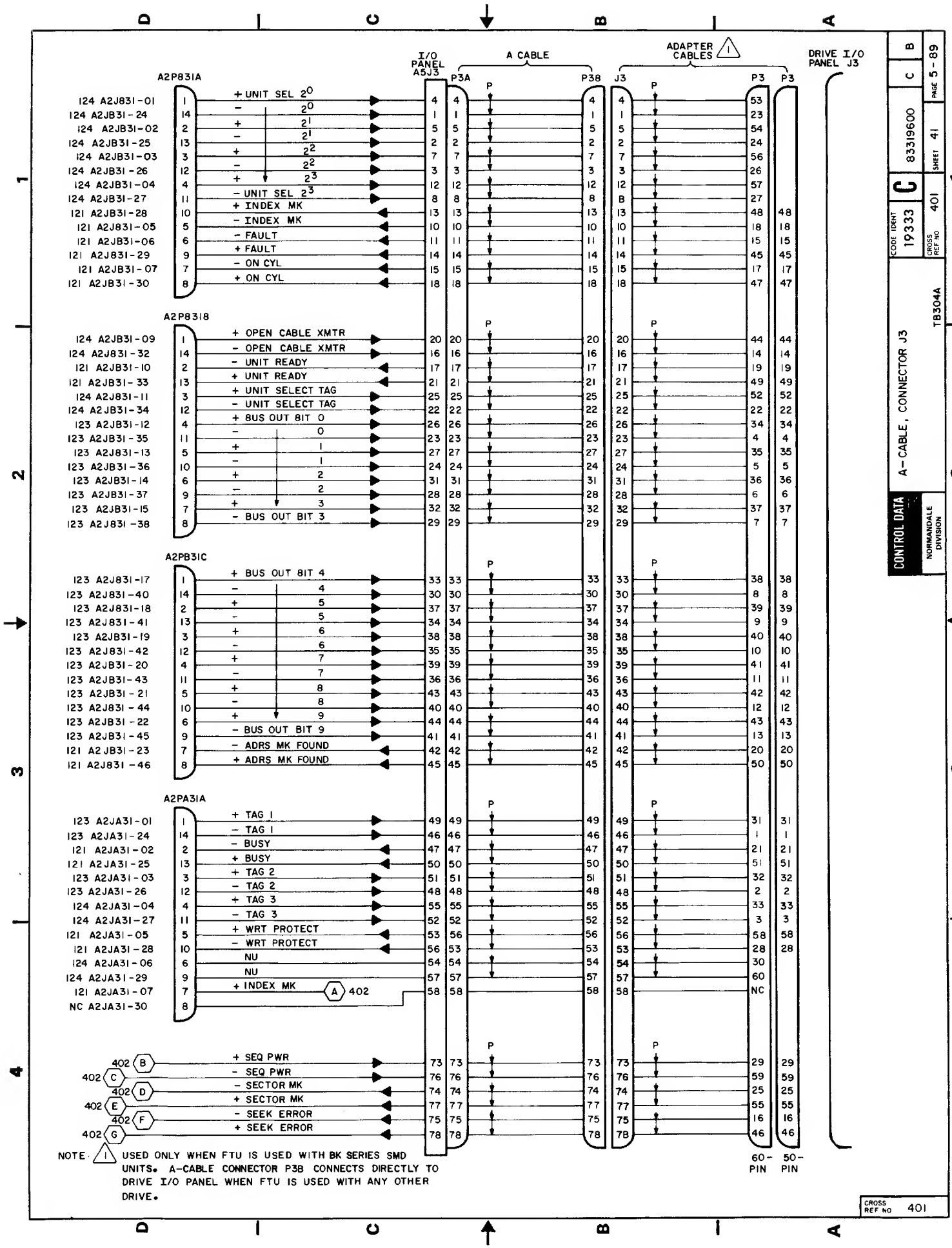
CROSS REF NO 304


204 A3P1-06 A3J1-06 + INDEX MK
204 A3P3-02 A3J3-02 + SECTOR MK
204 A3P1-07 A3J1-07 + ADRS MK FOUND
301 C - ON CYL
204 A3P1-09 A3J1-09 + WRT DATA
204 A3P2-02 A3J2-02 + FTU WRT CLK
204 A3P2-05 05 + RD DATA
204 A3P2-01 01 + RD CLK • (-RD ERROR)
204 A3P1-13 A3J1-13 + WRT GATE
204 A3P1-14 14 + RD GATE
301 8 - ADRS ERROR
301 A - DATA ERROR
204 A3P1-03 A3J1-03 + T3
204 A3P1-02 02 + ENABLE HD SEL TAG
204 A3P1-01 01 + ENABLE CNTL SEL TAG
204 A3P1-05 05 + BUS OUT MUX BIT 9
204 A3P2-06 A3J2-06 8
204 A3P2-07 07 7
204 A3P3-01 A3J3-01 6
204 A3P2-03 A3J2-03 5
204 A3P2-04 04 4
204 A3P3-03 A3J3-03 3
204 A3P3-07 07 2
204 A3P3-04 04 1
204 A3P3-06 06 + BUS OUT MUX BIT 0
204 A3P1-08,10-12 A3J1-08,10→12 GND
204 A3P2-8→14 A3J2-8→14
204 A3P3-8→14 A3J3-8→14
203 A3P4-08 A3J4-08
203 A3P5-08 A3J5-08
203 A3P6-08 A3J6-08
202 A3P7-08 A3J7-08
202 A3P8-08 A3J8-08
202 A3P9-08 A3J9-08
201 A3P10-8,10,11,12 A3J10-08,10,11,12
201 A3P11-08 A3J11-08
201 A3P12-08 A3J12-08 GND
204 A3P1-04 A3J1-04 (NU) R52 (NU) TP25
204 A3P3-05 A3J3-05 (NU) R53 (NU) TP26
100Ω (27) 1
R63 TP00
R64 TP01
R65 TP02
R66 TP03
R67 TP04
R68 TP05
R69 TP06
R70 TP07
R71 TP08
R72 TP09
R73 TP10
R74 TP11
R75 TP12
R76 TP13
R77 TP14
R78 TP15
R79 TP16
R80 TP17
R81 TP18
R82 TP19
R83 TP20
R84 TP21
R85 TP22
R86 TP23
R87 TP24
TP27
NOTES:
1 TEST POINT NAMES AS INDICATED ON FTU CONTROL PANEL ARE SHOWN ON CROSS REF NO 300.
CONTROL DATA NORMANDALE DIVISION
CNTL PANEL TEST POINTS
TB304A
CODE IDENT 19333
C
CROSS REF NO 305
83319600
C
A
PAGE 5-87
SHEET 39
CROSS REF NO 305



NOTES:

1. USED ONLY ON BK SERIES SMD UNITS. A CABLE (P3B) AND B CABLE (P2B) CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.



NOTE 1: USED ONLY WHEN FTU IS USED WITH BK SERIES SMD UNITS. A-CABLE CONNECTOR P3B CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.

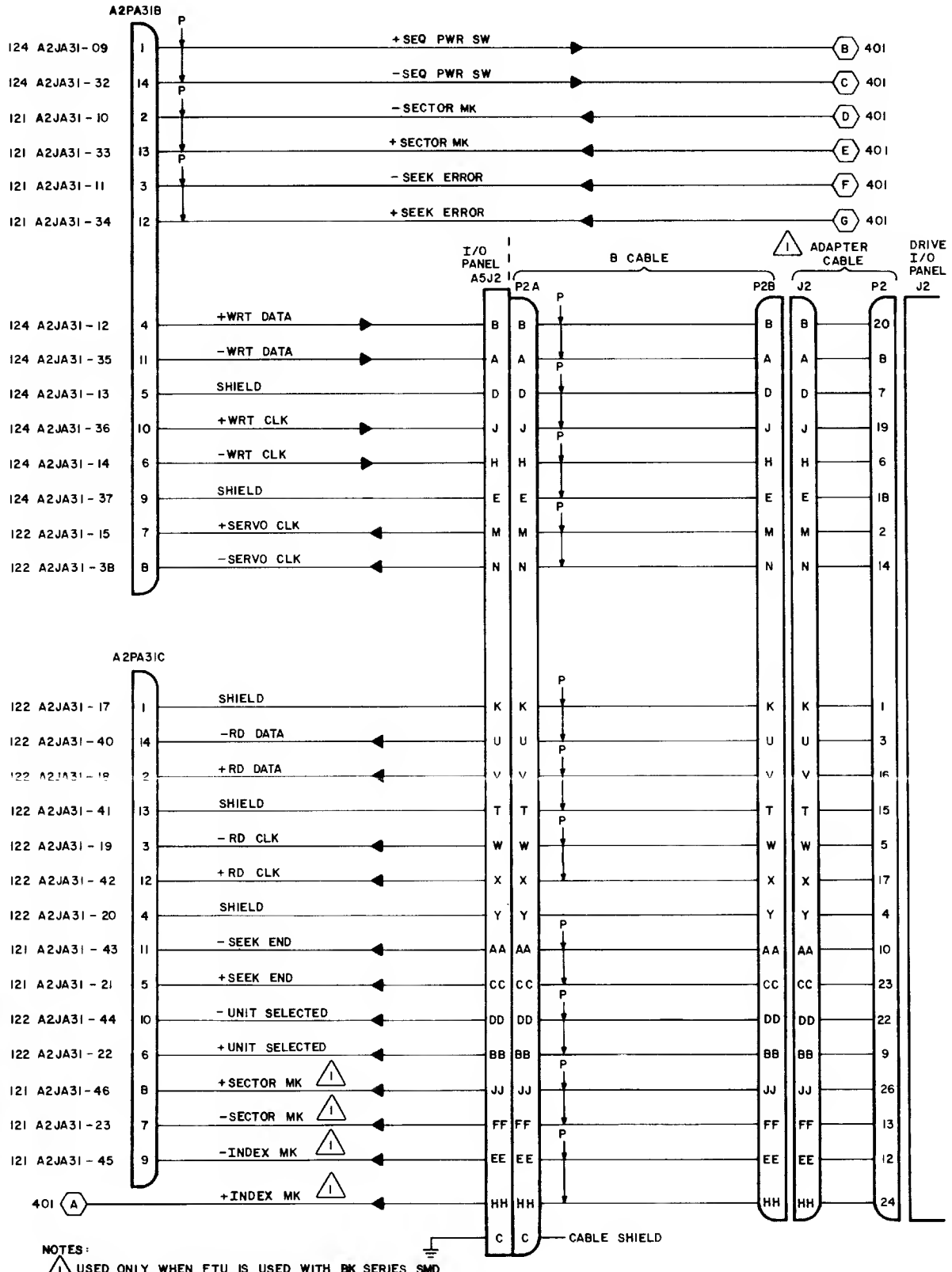
CONTROL DATA NORMANDALE DIVISION

A-CABLE, CONNECTOR J3

TB304A

CODE IDENT 19333 | C | 83319600 | B | C | PAGE 5-89 | SHEET 41 | CROSS REF NO 401

CROSS REF NO 401



NOTES:

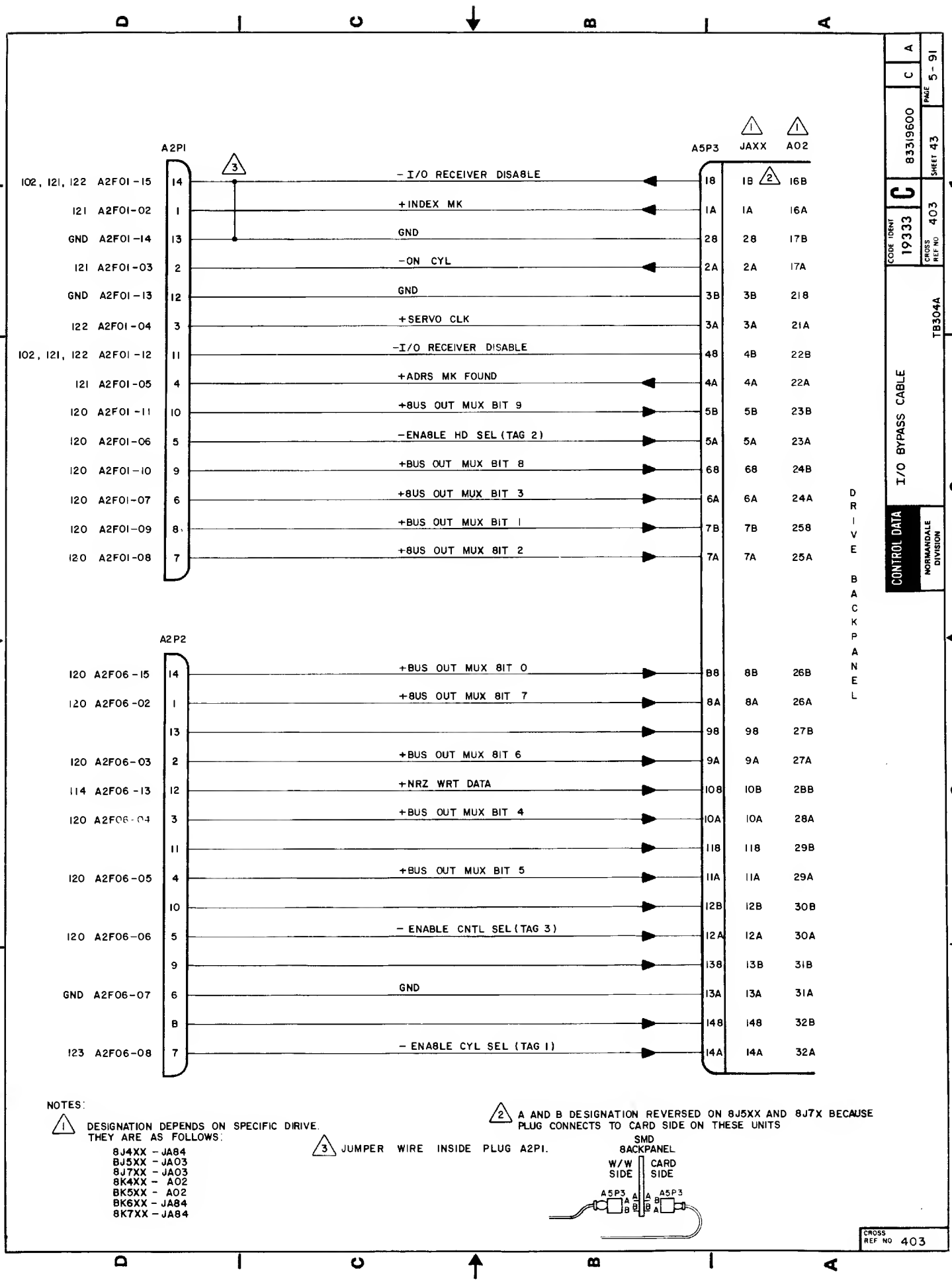
1. USED ONLY WHEN FTU IS USED WITH BK SERIES SMD UNITS. B-CABLE CONNECTOR P2B CONNECTS DIRECTLY TO DRIVE I/O PANEL WHEN FTU IS USED WITH ANY OTHER DRIVE.

CONTROL DATA
NORMANDALE DIVISION

B CABLE, CONNECTOR J2
TB304A

CODE IDENT 19333
C
83319600
A
C
SHEET 42
PAGE 5-90
CROSS REF NO 402

CROSS REF NO 402



NOTES:

1. DESIGNATION DEPENDS ON SPECIFIC DIRIVE. THEY ARE AS FOLLOWS:
   - 8J4XX - JA84
   - 8J5XX - JA03
   - 8J7XX - JA03
   - 8K4XX - A02
   - 8K5XX - A02
   - 8K6XX - JA84
   - 8K7XX - JA84

2. A AND B DESIGNATION REVERSED ON 8J5XX AND 8J7X BECAUSE PLUG CONNECTS TO CARD SIDE ON THESE UNITS

3. JUMPER WIRE INSIDE PLUG A2P1.

CROSS REF NO 403

SECTION 6

WIRE LISTS

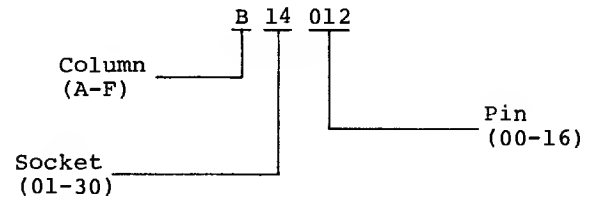
INTRODUCTION

This section contains the Logic-Board wire wrap lists for the TB304B/C and the TB304A. The two lists are identified by yellow divider sheets. The power and control-panel harnesses, as well as the various I/O cables, are fully documented in the diagrams section.

The wire wrap lists are double-ended. That is, each wire is presented twice. Each end of the wire appears once as an origin, and again as a Destination. For example:

ORIGIN	DESTINATION	Z
A04013	C29002	1
•	•	
•	•	
•	•	
C29002	A04013	1

Each list is arranged alphanumerically by origin, A01001 being the first entry and JF31029 the last. The location coordinates (Columns A-F, sockets 01-03) and pin numbers are interpreted as shown below.



The pin numbers are those for the 16-pin IC sockets, not for the IC chips themselves. See CR 011 for more information on this matter.

The Z column shows the position of the wire on the wire-wrap pin. Level 1 is the wrap closest to the board surface. Only two wraps are present on any pin.

TB304B/C

WIRE LIST

TITLE LOGIC BOARD WIRE WRAP (TB304B/C) (REF: 83249903)	WL	DOCUMENT NO.	SHEET NO. 1 of 33	REV. D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A01001	JA31015		1
A01001	A06010		2
A01002	JA31038		1
A01002	A06009		2
A01003	JA31044		1
A01003	A06007		2
A01004	JA31022		1
A01004	A06006		2
A01013	A15012		1
A01014	A15013		1
A01015	A15003		1
A01016	A15002		1
A02001	JB31006		1
A02001	A07011		2
A02002	JB31029		1
A02002	A07012		2
A02003	JA31028		1
A02003	A07013		2
A02004	JA31005		1
A02004	A07014		2
A02005	JA31040		1
A02005	A06002		2
A02006	JA31018		1
A02006	A06003		2
A02007	JA31019		1
A02007	A06004		2
A02008	JA31042		1
A02008	A06005		2
A02009	A14012		1
A02010	A14013		1
A02011	A14003		1
A02012	A14002		1
A02013	A13012		1
A02014	A13013		1
A02015	A13003		1
A02016	A13002		1
A03001	JA31002		1
A03001	A07002		2
A03002	JA31025		1
A03002	A07003		2
A03003	JB31007		1
A03003	A07004		2
A03004	JB31030		1
A03004	A07005		2
A03005	JA31043		1
A03005	A07010		2
A03006	JA31021		1
A03006	A07009		2
A03007	JA31011		1
A03007	A07007		2
A03008	JA31034		1
A03008	A07006		2
A03009	A12012		1
A03010	A12013		1
A03011	A12003		1
A03012	A12002		1
A03013	A11012		1
A03014	A11013		1
A03015	A11003		1
A03016	A11002		1
A04001	JB31028		1
A04001	A08002		2
A04002	JB31005		1
A04002	A08003		2
A04003	JA31010		1
A04003	A08004		2
A04004	JA31033		1
A04004	A08005		2
A04005	JB31046		1
A04005	A08010		2
A04006	JB31023		1
A04006	A08009		2
A04007	JB31010		1
A04007	A08007		2
A04008	JB31038		1
A04008	A08006		2
A04009	A10012		1
A04010	A10013		1
A04011	A10003		1
A04012	A10002		1
A04013	A05012		1
A04014	A05013		1
A04015	A05003		1
A04016	A05002		1
A05002	A04016		1
A05003	A04015		1
A05005	A19009		1
A05006	A05007		1
A05007	A05009		2
A05007	A05006		1
A05008	JA31020		1
A05009	A10006		1
A05009	A05007		2
A05010	A16012		1
A05012	A04013		1
A05013	A04014		1
A05014	A10014		1
A05015	A05016		1
A05016	A05015		1
A06002	A02005		2
A06003	A02006		2
A06004	A02007		2
A06005	A02008		2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			2	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
A06006	A01004	2
A06007	A01003	2
A06007	A09010	1
A06009	A01002	2
A06010	A01001	2
A07002	A03001	2
A07002	A09002	1
A07003	A03002	2
A07004	A03003	2
A07004	A09003	1
A07005	A03004	2
A07006	A03008	2
A07007	A03007	2
A07007	A09004	1
A07009	A03006	2
A07009	A09005	1
A07010	A03005	2
A07011	A02001	2
A07011	A09006	1
A07012	A02002	2
A07013	A02003	2
A07013	A09007	1
A07014	A02004	2
A08002	A04001	2
A08002	JA31007	1
A08003	A04002	2
A08003	JA31045	1
A08004	A04003	2
A08004	JA31023	1
A08005	A04004	2
A08005	JA31046	1
A08006	A04008	2
A08007	A04007	2
A08007	A09001	1
A08009	A04006	2
A08010	A04005	2
A09001	A08007	1
A09002	A07002	1
A09003	A07004	1
A09004	A07007	1
A09005	A07009	1
A09006	A07011	1
A09007	A07013	1
A09010	A06007	1
A10002	A04012	1
A10003	A04011	1
A10005	A19010	1
A10006	A10007	2
A10006	A05009	1
A10007	A10009	1
A10007	A10006	2
A10009	A15006	2

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
A10009	A10007	1
A10010	A19011	1
A10012	A04009	1
A10013	A04010	1
A10014	A05014	1
A10014	A15014	2
A10015	A10016	1
A10016	A10015	1
A11002	A03016	1
A11003	A03015	1
A11005	A19012	1
A11006	A11007	2
A11006	A12009	1
A11007	A11009	1
A11007	A11006	2
A11009	C01002	2
A11009	A11007	1
A11010	A19013	1
A11012	A03013	1
A11013	A03014	1
A11014	A12014	2
A11014	B15012	1
A11015	A11016	1
A11016	A11015	1
A12002	A03012	1
A12003	A03011	1
A12005	C20006	1
A12006	A12007	1
A12006	A13009	2
A12007	A12009	2
A12007	A12006	1
A12009	A11006	1
A12009	A12007	2
A12010	D19003	1
A12012	A03009	1
A12013	A03010	1
A12014	A13014	1
A12014	A11014	2
A12015	A12016	1
A12016	A12015	1
A13002	A02016	1
A13003	A02015	1
A13005	D19010	1
A13006	A13007	2
A13006	A14009	1
A13007	A13009	1
A13007	A13006	2
A13009	A12006	2
A13009	A13007	1
A13010	F19002	1
A13012	A02013	1
A13013	A02014	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			3	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	A13014	A14014	2
	A13014	A12014	1
	A13015	A13016	1
	A13016	A13015	1
	A14002	A02012	1
	A14003	A02011	1
	A14005	C25014	1
	A14006	A14009	2
	A14006	A15009	1
	A14007	A25003	2
	A14007	C05013	1
	A14009	A13006	1
	A14009	A14006	2
	A14010	B25009	2
	A14012	A02009	1
	A14013	A02010	1
	A14014	A15014	1
	A14014	A13014	2
	A14015	A14016	1
	A14016	A14015	1
	A15002	A01016	1
	A15003	A01015	1
	A15005	A19015	1
	A15006	A15007	1
	A15006	A10009	2
	A15007	A15009	2
	A15007	A15006	1
	A15009	A14006	1
	A15009	A15007	2
	A15010	A19014	1
	A15012	A01013	1
	A15013	A01014	1
	A15014	A10014	2
	A15014	A14014	1
	A15015	A15016	1
	A15016	A15015	1
	A16004	A23010	2
	A16005	A21007	1
	A16006	A21009	2
	A16007	B18005	1
	A16011	B24011	1
	A16012	A05010	1
	A16012	A19001	2
	A16013	A17002	1
	A16014	B24007	1
	A16015	A16016	1
	A16016	A16015	1
	A17001	A18010	1
	A17001	A22011	2
	A17002	A16013	1
	A17002	A18002	2
	A17003	A19004	2
	A17004	A19003	2
	A17005	A19002	2
	A17006	A20009	1
	A17006	C15007	2
	A17007	A18015	1
	A17007	A17010	2
	A17009	B22004	2
	A17009	A18009	1
	A17010	A17007	2
	A17015	B24010	1
	A18001	A18007	1
	A18001	A18010	2
	A18002	A17002	2
	A18003	A19008	2
	A18004	A19007	2
	A18005	A19006	2
	A18006	A19005	2
	A18007	A24003	2
	A18007	A18001	1
	A18009	A17009	1
	A18010	A18001	2
	A18010	A17001	1
	A18015	A17007	1
	A19001	A16012	2
	A19001	B24006	1
	A19002	A20010	1
	A19002	A17005	2
	A19003	A20011	1
	A19003	A17004	2
	A19004	A20012	1
	A19004	A17003	2
	A19005	A20013	1
	A19005	A18006	2
	A19006	A20014	1
	A19006	A18005	2
	A19007	A20015	1
	A19007	A18004	2
	A19008	A20016	1
	A19008	A18003	2
	A19009	A05005	1
	A19009	C01005	2
	A19010	A10005	1
	A19010	B26005	2
	A19011	A10010	1
	A19011	C05014	2
	A19012	A11005	1
	A19012	F25012	2
	A19013	A11010	1
	A19013	B18011	2
	A19014	A15010	1
	A19014	F25014	2
	A19015	A15005	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP			4	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A19015	D22002	2	
A20001	A20002	1	
A20002	A20001	1	
A20002	A20003	2	
A20003	A20002	2	
A20003	A20004	1	
A20004	A20003	1	
A20004	A20005	2	
A20005	A20004	2	
A20005	A20006	1	
A20006	A20005	1	
A20006	A20007	2	
A20007	A20006	2	
A20007	A20008	1	
A20008	A20007	1	
A20009	A17006	1	
A20010	A19002	1	
A20011	A19003	1	
A20012	A19004	1	
A20013	A19005	1	
A20014	A19006	1	
A20015	A19007	1	
A20016	A19008	1	
A21001	A21002	1	
A21002	A21001	1	
A21002	B25015	2	
A21003	A21004	1	
A21004	A21003	1	
A21004	B25007	2	
A21005	A21014	2	
A21006	A22006	1	
A21007	A16005	1	
A21009	A21010	1	
A21009	A16006	2	
A21010	A21009	1	
A21011	A21012	1	
A21011	A22007	2	
A21012	A21011	1	
A21013	B25006	1	
A21014	A21005	2	
A21014	A21016	1	
A21015	B25014	1	
A21016	A21014	1	
A22001	A22008	1	
A22002	E25002	1	
A22002	B15006	2	
A22003	A27004	1	
A22003	A24010	2	
A22004	B24003	1	
A22006	A21006	1	
A22007	A21011	2	
A22008	A22001	1	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A22009	JC31013	2	
A22010	E16013	2	
A22011	A17001	2	
A22012	F14012	1	
A22014	A23013	1	
A22015	A23004	2	
A23001	A23002	1	
A23002	A23001	1	
A23002	A24015	2	
A23003	A23004	1	
A23004	A23003	1	
A23004	A22015	2	
A23005	A23006	1	
A23006	A23005	1	
A23006	A24007	2	
A23007	C20003	1	
A23009	A23010	1	
A23010	A23009	1	
A23010	A16004	2	
A23011	B21007	1	
A23011	A24006	2	
A23012	A23014	1	
A23013	A22014	1	
A23014	A23012	1	
A23014	A23016	2	
A23015	A24014	2	
A23016	A23014	2	
A24001	A24008	2	
A24002	A24011	2	
A24002	A24003	1	
A24003	A24002	1	
A24003	A18007	2	
A24004	B20006	1	
A24005	D03009	1	
A24006	A23011	2	
A24007	A23006	2	
A24008	A24009	1	
A24008	A24001	2	
A24009	A24008	1	
A24010	A22003	2	
A24010	A24011	1	
A24011	A24010	1	
A24011	A24002	2	
A24012	D14004	1	
A24013	D20005	1	
A24014	B21003	1	
A24014	A23015	2	
A24015	A23002	2	
A25002	C30002	2	
A25003	D18005	1	
A25003	A14007	2	
A25004	D28002	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			5	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A25005	C26012	2	
A25006	A25010	1	
A25007	C29004	1	
A25009	C29012	1	
A25010	F15004	2	
A25010	A25006	1	
A25011	C28002	1	
A25011	E28013	2	
A25012	E14014	1	
A25013	F21009	2	
A25014	F30005	1	
A25015	A25016	1	
A25016	A25015	1	
A26001	B30001	1	
A26002	C25013	1	
A26002	A26003	2	
A26003	A26002	2	
A26003	JF31013	1	
A26004	A30015	1	
A26004	B29006	2	
A26005	A30001	1	
A26005	B29005	2	
A26006	A29015	1	
A26006	B29004	2	
A26007	A29001	1	
A26007	B29003	2	
A26009	B30009	2	
A26010	B18012	1	
A26010	B30010	2	
A26012	B30002	1	
A26013	B29012	1	
A26014	B29011	1	
A26015	B29010	1	
A27001	B30007	1	
A27003	E29013	2	
A27003	A28003	1	
A27004	B25003	2	
A27004	A22003	1	
A27005	A27008	1	
A27006	B13012	1	
A27007	B27012	1	
A27008	A27005	1	
A27009	JE31043	1	
A27010	B14004	1	
A27011	B20004	1	
A27012	C14007	1	
A27013	E29014	2	
A27013	A28013	1	
A27015	B30006	1	
A28001	B30005	1	
A28003	A27003	1	
A28003	A29003	2	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A28004	A28008	1	
A28005	B20012	1	
A28006	B14012	1	
A28007	JE31041	1	
A28008	A28004	1	
A28008	A28010	2	
A28009	JE31036	1	
A28010	A28008	2	
A28011	B11004	1	
A28012	B12011	1	
A28013	A27013	1	
A28013	A29013	2	
A28015	B30004	1	
A29001	A26007	1	
A29003	A28003	2	
A29003	A30003	1	
A29004	B13005	1	
A29005	B11012	1	
A29006	A29008	1	
A29007	JE31010	1	
A29008	A29006	1	
A29008	A29010	2	
A29009	JE31007	1	
A29010	A29008	2	
A29011	B12004	1	
A29012	B13011	2	
A29013	A28013	2	
A29013	A30013	1	
A29015	A26006	1	
A30001	A26005	1	
A30003	A29003	1	
A30004	B14005	2	
A30005	B12012	1	
A30006	A30008	1	
A30007	JE31003	1	
A30008	A30006	1	
A30008	A30010	2	
A30009	JE31026	1	
A30010	A30008	2	
A30011	B13004	1	
A30012	B14011	1	
A30013	A29013	1	
A30015	A26004	1	
B01002	B01003	2	
B01002	JF31022	1	
B01003	B14015	1	
B01003	B01002	2	
B01004	B01005	1	
B01004	B02011	2	
B01005	B01011	2	
B01005	B01004	1	
B01006	B01007	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			6	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
B01006	JF31020		1
B01007	B14001		1
B01007	B01006		2
B01009	JB31013		1
B01010	JB31036		1
B01011	B06011		1
B01011	B01005		2
B01012	B06012		1
B01012	B02012		2
B01013	JB31035		1
B01014	JB31012		1
B01015	B01016		1
B01016	B01015		1
B02002	B02003		2
B02002	JF31023		1
B02003	B13015		1
B02003	B02002		2
B02004	B02005		2
B02004	B03011		1
B02005	B02011		1
B02005	B02004		2
B02006	B02007		2
B02006	JF31019		1
B02007	B13001		1
B02007	B02006		2
B02009	JB31015		1
B02010	JB31038		1
B02011	B01004		2
B02011	B02005		1
B02012	B01012		2
B02012	B03012		1
B02013	JB31037		1
B02014	JB31014		1
B02015	B02016		1
B02016	B02015		1
B03002	B03003		2
B03002	JF31012		1
B03003	B12015		1
B03003	B03002		2
B03004	B03005		1
B03004	B04011		2
B03005	B03011		2
B03005	B03004		1
B03006	B03007		2
B03006	JF31011		1
B03007	B12001		1
B03007	B03006		2
B03009	JB31018		1
B03010	JB31041		1
B03011	B02004		1
B03011	B03005		2
B03012	B02012		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
B03012	B04012		2
B03013	JB31040		1
B03014	JB31017		1
B03015	B03016		1
B03016	B03015		1
B04002	B04003		2
B04002	JF31017		1
B04003	B11015		1
B04003	B04002		2
B04004	B04005		2
B04004	B05011		1
B04005	B04011		1
B04005	B04004		2
B04006	B04007		2
B04006	JF31015		1
B04007	B11001		1
B04007	B04006		2
B04009	JB31020		1
B04010	JB31043		1
B04011	B03004		2
B04011	B04005		1
B04012	B03012		2
B04012	B05012		1
B04013	JB31042		1
B04014	JB31019		1
B04015	B04016		1
B04016	B04015		1
B05002	B05003		2
B05002	JF31014		1
B05003	B20015		1
B05003	B05002		2
B05004	B05005		1
B05005	B05011		2
B05005	B05004		1
B05006	B05007		2
B05006	JF31005		1
B05007	B20001		1
B05007	B05006		2
B05009	JB31022		1
B05010	JB31045		1
B05011	B04004		1
B05011	B05005		2
B05012	B04012		1
B05012	JC31043		2
B05013	JB31044		1
B05014	JB31021		1
B05015	B05016		1
B05016	B05015		1
B06002	C02005		1
B06002	B06003		2
B06003	B06002		2
B06003	F02002		1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			7	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	B06004	B07011	2
	B06004	B06005	1
	B06005	B06004	1
	B06005	B06011	2
	B06006	B06007	2
	B06006	JF31002	1
	B06007	B18004	1
	B06007	B06006	2
	B06009	JA31003	1
	B06010	JA31026	1
	B06011	B06005	2
	B06011	B01011	1
	B06012	B07012	2
	B06012	B01012	1
	B06013	JA31024	1
	B06014	JA31001	1
	B06015	B06016	1
	B06016	B06015	1
	B07002	E14010	1
	B07002	B07003	2
	B07003	B07002	2
	B07004	B08011	1
	B07004	B07005	2
	B07005	B07004	2
	B07005	B07011	1
	B07006	JC31022	1
	B07006	B07007	2
	B07007	B07006	2
	B07007	F12011	1
	B07009	JB31001	1
	B07010	JB31024	1
	B07011	B07005	1
	B07011	B06004	2
	B07012	B08012	1
	B07012	B06012	2
	B07013	JB31034	1
	B07014	JB31011	1
	B07015	B07016	1
	B07016	B07015	1
	B08002	JC31023	1
	B08002	B08003	2
	B08003	B08002	2
	B08003	B14007	1
	B08004	B09011	2
	B08004	B08005	1
	B08005	B08004	1
	B08005	B08011	2
	B08006	JC31040	1
	B08006	B08007	2
	B08007	B08006	2
	B08007	B13009	1
	B08009	JB31003	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	B08010	JB31026	1
	B08011	B08005	2
	B08011	B07004	1
	B08012	B09012	2
	B08012	B07012	1
	B08013	JB31025	1
	B08014	JB31002	1
	B08015	B08016	1
	B08016	B08015	1
	B09002	JC31041	1
	B09002	B09003	2
	B09003	B09002	2
	B09003	B13007	1
	B09004	B10011	1
	B09004	B09005	2
	B09005	B09004	2
	B09005	B09011	1
	B09006	B09007	2
	B09006	F03012	1
	B09007	C20004	1
	B09007	B09006	2
	B09009	JA31004	1
	B09010	JA31027	1
	B09011	B09005	1
	B09011	B08004	2
	B09012	B10012	1
	B09012	B08012	2
	B09013	JB31027	1
	B09014	JB31004	1
	B09015	B09016	1
	B09016	B09015	1
	B10004	B10005	1
	B10004	B10011	2
	B10005	B15004	2
	B10005	B10004	1
	B10006	B10007	1
	B10007	C15010	2
	B10007	B10006	1
	B10009	JB31009	1
	B10010	JB31032	1
	B10011	B10004	2
	B10011	B09004	1
	B10012	B15012	2
	B10012	B09012	1
	B10013	JA31029	1
	B10014	JA31006	1
	B10015	B10016	1
	B10016	B10015	1
	B11001	B04007	1
	B11002	F03004	1
	B11003	B12003	2
	B11004	D09004	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			8	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
	B11004	A28011	1
	B11005	B11007	1
	B11006	C14009	1
	B11007	B11005	1
	B11007	B1100A	2
	B1100A	B11007	2
	B1100A	B11009	1
	B11009	B1100A	1
	B11009	B11011	2
	B11010	D03004	1
	B11010	B21014	2
	B11011	B11009	2
	B11012	D09012	2
	B11012	A29005	1
	B11013	B12013	2
	B11013	C06004	1
	B11014	F03002	1
	B11015	B04003	1
	B12001	B03007	1
	B12002	F04014	1
	B12003	B13003	1
	B12003	B11003	2
	B12004	D08004	2
	B12004	A29011	1
	B12005	B12007	1
	B12006	B27007	1
	B12007	B12005	1
	B12007	B1200A	2
	B12008	B12007	2
	B1200A	B12009	1
	B12009	B1200A	1
	B12010	B16014	1
	B12011	D08011	2
	B12011	A28012	1
	B12012	D08012	2
	B12012	A30005	1
	B12013	B13013	1
	B12013	B11013	2
	B12014	F04012	1
	B12015	B03003	1
	B13001	B02007	1
	B13002	F04010	1
	B13003	B14003	2
	B13003	B12003	1
	B13004	D07004	2
	B13004	A30011	1
	B13005	D07005	2
	B13005	A29004	1
	B13006	F24012	1
	B13007	B09003	1
	B13009	B08007	1
	B13010	F23004	1
	B13011	D07011	1
	B13011	A29012	2
	B13012	D07012	2
	B13012	A27006	1
	B13013	B14013	2
	B13013	B12013	1
	B13014	F04006	1
	B13015	B02003	1
	B14001	B01007	1
	B14002	F04004	1
	B14003	B19003	1
	B14003	B13003	2
	B14004	D06004	2
	B14004	A27010	1
	B14005	D06005	1
	B14005	A30004	2
	B14006	C18010	2
	B14006	B25010	1
	B14007	B08003	1
	B14009	F12009	1
	B14010	C15002	2
	B14010	JF31025	1
	B14011	D06011	2
	B14011	A30012	1
	B14012	D06012	2
	B14012	A28006	1
	B14013	B19013	1
	B14013	B13013	2
	B14014	F04002	1
	B14015	B01003	1
	B15002	C10010	1
	B15002	B15003	2
	B15003	B15002	2
	B15003	JF31029	1
	B15004	B15005	1
	B15004	B10005	2
	B15005	B15011	2
	B15005	B15004	1
	B15006	A22002	2
	B15006	B15007	1
	B15007	B15006	1
	B15007	JF31010	2
	B15009	JA31036	1
	B15010	JA31014	1
	B15011	C15014	1
	B15011	B15005	2
	B15012	A11014	1
	B15012	B10012	2
	B15013	JA31035	1
	B15014	JA31012	1
	B15015	B15016	1
	B15016	B15015	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
B16002	C02010	1
B16002	C14003	2
B16003	E16003	1
B16003	F28003	2
B16004	C03002	2
B16005	C16002	1
B16006	F17010	1
B16007	E20010	1
B16009	E30004	1
B16010	E26014	1
B16011	E26013	1
B16012	E20014	2
B16013	B17010	1
B16014	E20002	2
B16014	B12010	1
B16015	B16016	1
B16016	B16015	1
B17002	C13013	2
B17002	C20010	1
B17003	C19014	2
B17003	F20012	1
B17005	C12004	1
B17006	C12007	1
B17007	B18002	1
B17009	B18006	1
B17010	B16013	1
B17011	D25013	1
B17013	C14014	1
B17013	JD31020	2
B17014	C18011	1
B17014	JD31021	2
B17015	B17016	1
B17016	B17015	1
B18002	B17007	1
B18002	D25002	2
B18003	E16002	2
B18004	B06007	1
B18005	A16007	1
B18005	C20002	2
B18006	B17009	1
B18006	C20003	2
B18007	F30013	1
B18009	C07004	1
B18010	C20007	1
B18011	A19013	2
B18011	F01003	1
B18012	A26010	1
B18013	JF31009	2
B18014	B26012	1
B18015	B18016	1
B18016	B18015	1
B19003	B20003	2
B19003	B14003	1
B19013	B20013	2
B19013	B14013	1
B20001	B05007	1
B20002	F03010	1
B20003	F30012	1
B20003	B19003	2
B20004	D10004	2
B20004	A27011	1
B20005	B20007	1
B20006	A24004	1
B20007	B20005	1
B20007	B20008	2
B20008	B20007	2
B20008	B20009	1
B20009	B20008	1
B20009	B20011	2
B20010	C14012	1
B20011	B20009	2
B20012	D10012	2
B20012	A28005	1
B20013	F30007	1
B20013	B19013	2
B20014	F03006	1
B20015	B05003	1
B21002	JC31020	1
B21002	C05003	2
B21003	A24014	1
B21004	JC31012	1
B21005	C18012	2
B21005	C15002	1
B21006	JD31022	1
B21007	A23011	1
B21009	D04013	1
B21010	JD31044	1
B21011	JD31043	1
B21012	D13012	1
B21013	C11001	2
B21014	B11010	2
B21015	B21016	1
B21016	B21015	1
B22002	D15005	2
B22003	B23009	1
B22004	B23007	1
B22004	A17009	2
B22005	B24009	1
B22006	B23003	1
B22010	C27004	1
B22011	C23011	1
B22011	B23014	2
B22012	F10012	1
B22013	C22003	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			10	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
B22013	D25004	1
B22014	C04004	1
B22014	C28014	2
B22015	B22016	1
B22016	B22015	1
B23002	B28007	1
B23002	B25011	2
B23003	B22006	1
B23003	D15006	2
B23004	B24011	2
B23004	JF31018	1
B23005	C01011	2
B23005	B24005	1
B23007	B22004	1
B23008	B23013	1
B23009	B22003	1
B23011	B24012	1
B23012	B24006	2
B23013	B23008	1
B23014	B22011	2
B23014	B28009	1
B23015	B23016	1
B23016	B23015	1
B24002	F09013	2
B24003	A22004	1
B24004	C30005	1
B24005	B23005	1
B24006	A19001	1
B24006	B23012	2
B24007	A16014	1
B24009	B22005	1
B24010	A17015	1
B24010	B24013	2
B24011	A16011	1
B24011	B23004	2
B24012	B23011	1
B24013	B24010	2
B24014	C01005	1
B24014	F01002	2
B24015	B24016	1
B24016	B24015	1
B25001	B25008	1
B25002	D20009	1
B25003	B25011	1
B25003	A27004	2
B25004	E17002	1
B25006	A21013	1
B25007	A21004	2
B25008	B25001	1
B25009	A14010	2
B25009	F24002	1
B25010	B14006	1
B25010	E28002	2
B25011	B23002	2
B25011	B25003	1
B25012	C30012	1
B25014	A21015	1
B25015	A21002	2
B26002	JC31024	1
B26002	C25006	2
B26003	C25011	1
B26003	F13002	2
B26004	C27003	1
B26005	A19010	2
B26005	JF31007	1
B26006	C06011	1
B26006	F15010	2
B26007	C27014	1
B26009	B27011	1
B26010	B29014	1
B26011	C28010	1
B26012	B18014	1
B26013	D29012	1
B26014	F20003	1
B26015	B26016	1
B26016	B26015	1
B27002	B27010	1
B27002	E29006	2
B27003	C27010	1
B27004	F10010	1
B27005	C27009	1
B27006	C27007	1
B27007	B12006	1
B27009	D18006	1
B27010	C30013	2
B27010	B27002	1
B27011	B26009	1
B27012	A27007	1
B27013	E28009	1
B27014	D17011	1
B27015	B27016	1
B27016	B27015	1
B28001	B28008	1
B28002	B29007	1
B28003	B30007	2
B28004	B30006	2
B28005	B30005	2
B28006	B30004	2
B28007	B28009	2
B28007	B23007	1
B28008	B28001	1
B28009	B23014	1
B28009	B28007	2
B28010	B30015	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			11	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
B28010	D07009	2
B28011	B30014	1
B28011	D07007	2
B28012	B30013	1
B28012	D08009	2
B28013	B30012	1
B28013	C10013	2
B28015	B29009	1
B29001	B29008	1
B29003	A26007	2
B29004	A26006	2
B29005	A26005	2
B29006	A26004	2
B29007	B28002	1
B29008	B29001	1
B29009	B28015	1
B29010	A26015	1
B29011	A26014	1
B29012	A26013	1
B29012	D06009	2
B29013	B30003	1
B29013	D06007	2
B29014	B26010	1
B30001	F27001	2
B30001	A26001	1
B30002	A26012	1
B30002	B30003	2
B30003	B30002	2
B30003	B29013	1
B30004	A28015	1
B30004	B28006	2
B30005	A28001	1
B30005	B28005	2
B30006	A27015	1
B30006	B28004	2
B30007	A27001	1
B30007	B28003	2
B30009	F15007	1
B30009	A26009	2
B30010	A26010	2
B30010	C28004	1
B30012	B28013	1
B30013	B28012	1
B30014	B28011	1
B30015	B28010	1
C01002	C15015	1
C01002	A11009	2
C01003	D05001	2
C01003	C01006	1
C01004	D18004	1
C01005	A19009	2
C01005	B24014	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C01006	C01003	1
C01007	C01011	1
C01009	C01014	1
C01010	D05004	1
C01011	C01007	1
C01011	B23005	2
C01012	C09004	1
C01013	D19002	2
C01013	C04003	1
C01014	C01009	1
C01014	C02003	2
C01015	C01016	1
C01016	C01015	1
C02002	C09010	1
C02003	C01014	2
C02003	C04002	1
C02004	D16011	1
C02004	C10002	2
C02005	JE31003	2
C02005	B06002	1
C02006	JC31003	1
C02006	C20013	2
C02007	C08005	1
C02009	F15002	1
C02010	D13014	2
C02010	B16002	1
C02011	C08007	1
C02012	C14006	1
C02013	JE31023	1
C02013	C03010	2
C02014	JD31015	1
C02015	C02016	1
C02016	C02015	1
C03002	E20007	1
C03002	B16004	2
C03003	C19003	1
C03004	C19002	1
C03005	F14003	1
C03005	C04010	2
C03006	JC31002	1
C03007	C04014	1
C03009	E07002	1
C03010	C02013	2
C03011	E16011	1
C03012	C06002	1
C03013	C08004	1
C03013	C19005	2
C03014	F15006	1
C03014	C24014	2
C03015	C03016	1
C03016	C03015	1
C04002	C02003	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			12	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C04002	C13014	2
C04003	C01013	1
C04004	B22014	1
C04005	C06013	1
C04006	C09013	2
C04007	C06006	1
C04009	E12014	1
C04010	C03005	2
C04011	C09006	1
C04011	D12010	2
C04012	E12004	1
C04013	C09003	2
C04013	C19014	1
C04014	C03007	1
C04014	F05005	2
C04015	C04016	1
C04016	C04015	1
C05002	JC31021	1
C05003	B21002	2
C05004	F19012	1
C05005	D13002	1
C05006	E02001	1
C05007	E03004	1
C05008	C31046	2
C05009	D25005	1
C05010	D14006	2
C05010	F26011	1
C05011	C24003	2
C05012	C18004	1
C05013	A14007	1
C05014	A19011	2
C05015	C05016	1
C05016	C05015	1
C06002	C03012	1
C06002	C17003	2
C06003	C16014	1
C06004	B11013	1
C06005	C11003	1
C06006	C04007	1
C06007	F05013	1
C06009	C08012	1
C06010	C13007	1
C06011	B26006	1
C06012	JD31045	1
C06012	C08002	2
C06013	C04005	1
C06014	D25006	1
C06015	C06016	1
C06016	C06015	1
C07002	C07005	1
C07002	C09014	2
C07003	JD31033	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C07003	F09005	2
C07004	B18009	1
C07004	C07012	2
C07005	C07011	2
C07005	C07002	1
C07006	F24014	1
C07007	F23003	1
C07010	F09011	1
C07011	C15013	1
C07011	C07005	2
C07012	C07004	2
C07012	F14004	1
C07013	F24011	2
C07013	D12011	1
C07014	F26011	2
C07014	E11011	1
C07015	C07016	1
C07016	C07015	1
C08002	C06012	2
C08002	D20003	1
C08003	C08008	1
C08004	C10006	2
C08004	C03013	1
C08005	C02007	1
C08006	C13010	2
C08006	C13011	1
C08007	C02011	1
C08008	C08003	1
C08010	C09012	1
C08011	D03012	1
C08012	C06009	1
C08013	C14004	1
C08014	F15009	1
C08015	C08016	1
C08016	C08015	1
C09002	F05007	1
C09003	C09007	1
C09003	C04013	2
C09004	C01012	1
C09004	D14012	2
C09005	C22011	1
C09005	E26003	2
C09006	C04011	1
C09007	C09003	1
C09009	C12005	1
C09010	C02002	1
C09011	C16007	1
C09012	C08010	1
C09012	E19003	2
C09013	D17007	1
C09013	C04006	2
C09014	C07002	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			13	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
C09014	C10011	1	
C09015	C09016	1	
C09016	C09015	1	
C10002	C02004	2	
C10003	C11012	2	
C10004	D16009	1	
C10005	C10011	2	
C10006	C08004	2	
C10007	C13006	1	
C10009	F02004	1	
C10010	B15002	1	
C10011	C09014	1	
C10011	C10005	2	
C10012	C23012	1	
C10012	E26002	2	
C10013	B28013	2	
C10013	D08007	1	
C10014	C19009	1	
C10015	C10016	1	
C10016	C10015	1	
C11001	C11004	1	
C11001	B21013	2	
C11002	C11006	2	
C11003	C06005	1	
C11004	E06014	2	
C11004	C11001	1	
C11005	F19007	1	
C11005	C18014	2	
C11006	C11008	1	
C11006	C11002	2	
C11007	C11016	1	
C11008	C11006	1	
C11008	C11013	2	
C11010	F21001	1	
C11011	C11012	1	
C11012	C11011	1	
C11012	C10003	2	
C11013	C11008	2	
C11014	C11015	1	
C11015	C11014	1	
C11015	D20011	2	
C11016	C11007	1	
C12002	C12006	2	
C12003	C19005	1	
C12003	C21003	2	
C12004	B17005	1	
C12005	C09009	1	
C12006	E14006	1	
C12006	C12002	2	
C12007	B17006	1	
C12009	E01006	1	
C12010	JC31019	1	
C12010	E20004	2	
C12011	D18012	2	
C12011	E15006	1	
C12015	C12016	1	
C12016	C12015	1	
C13002	C18014	1	
C13002	F05014	2	
C13003	C14005	2	
C13003	D18010	1	
C13005	E16014	2	
C13006	C10007	1	
C13006	E13013	2	
C13007	C06010	1	
C13009	D16010	1	
C13010	C08006	2	
C13011	C08006	1	
C13011	C14002	2	
C13013	C13014	1	
C13013	B17002	2	
C13014	C04002	2	
C13014	C13013	1	
C13015	C13016	1	
C13016	C13015	1	
C14002	C13011	2	
C14003	B16002	2	
C14003	E13014	1	
C14004	C08013	1	
C14005	JC31009	1	
C14005	C13003	2	
C14006	C02012	1	
C14007	A27012	1	
C14009	B11006	1	
C14010	C18009	1	
C14010	C14014	2	
C14011	JD31014	1	
C14012	B20010	1	
C14013	JD31011	1	
C14014	C14010	2	
C14014	B17013	1	
C14015	C14016	1	
C14016	C14015	1	
C15001	E14011	2	
C15002	B21005	1	
C15002	B14010	2	
C15006	F21011	1	
C15007	A17006	2	
C15010	C22005	1	
C15010	B10007	2	
C15011	E11005	2	
C15012	C30003	1	
C15013	C07011	1	
C15013	C21005	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			14	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C15014	B15011		1
C15015	C01002		1
C15015	C20005		2
C16002	F30009		2
C16002	B16005		1
C16003	D13010		2
C16003	C16004		1
C16004	C16003		1
C16005	D16007		1
C16006	C19012		1
C16007	C09011		1
C16009	C23004		1
C16010	F13007		1
C16011	E29010		2
C16014	C06003		1
C16014	C19011		2
C16015	C16016		1
C16016	C16015		1
C17002	C21007		1
C17002	E12011		2
C17003	C06002		2
C17004	D17010		1
C17005	C21009		1
C17006	C17011		2
C17007	C18010		1
C17009	C30013		1
C17010	C22007		1
C17011	E15012		1
C17011	C17006		2
C17012	E03005		1
C17013	F24007		1
C17014	E20009		1
C17015	C17016		1
C17016	C17015		1
C18002	E30009		1
C18003	JE31034		1
C18004	C05012		1
C18004	D19004		2
C18005	JE31024		1
C18006	E30013		1
C18007	JE31029		1
C18009	C14010		1
C18010	C17007		1
C18010	B14006		2
C18011	B17014		1
C18012	B21005		2
C18012	D15004		1
C18013	JE31001		1
C18014	C11005		2
C18014	C13002		1
C18015	C18016		1
C18016	C18015		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C19002	C03004		1
C19003	F20010		2
C19003	C03003		1
C19004	D15011		1
C19005	C03013		2
C19005	C12003		1
C19006	C26009		1
C19007	D23014		1
C19009	C10014		1
C19010	C24002		2
C19011	C16014		2
C19011	C23005		1
C19012	C16006		1
C19013	D24009		1
C19014	C04013		1
C19014	B17003		2
C19015	C19016		1
C19016	C19015		1
C20002	B18005		2
C20003	B18006		2
C20003	A23007		1
C20004	B09007		1
C20005	C15015		2
C20005	F01015		1
C20006	A12005		1
C20007	B18010		1
C20009	C20014		1
C20010	B17002		1
C20010	D28005		2
C20011	D14010		1
C20012	F20011		1
C20013	C02006		2
C20013	D17006		1
C20014	C20009		1
C20015	C20016		1
C20016	C20015		1
C21002	C22014		2
C21003	C12003		2
C21003	D14013		1
C21004	C21012		2
C21004	C22004		1
C21005	C15013		2
C21005	C21011		1
C21006	C21013		1
C21007	C17002		1
C21009	C17005		1
C21010	C22003		1
C21011	C21005		1
C21011	C23011		2
C21012	D24007		1
C21012	C21004		2
C21013	C21006		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
C21013	C26004	2
C21014	D23012	1
C21014	C22002	2
C21015	C21016	1
C21016	C21015	1
C22002	C21014	2
C22003	C21010	1
C22003	B22013	2
C22004	C21004	1
C22005	C15010	1
C22005	C22011	2
C22006	C22013	1
C22006	C24011	2
C22007	C17010	1
C22010	C24002	1
C22011	C22005	2
C22011	C09005	1
C22012	D24012	1
C22013	C22006	1
C22013	D24011	2
C22014	D23009	1
C22014	C21002	2
C22015	C22016	1
C22016	C22015	1
C23002	C25009	1
C23002	C23014	2
C23003	C23013	2
C23003	E26007	1
C23004	C16009	1
C23004	D29012	2
C23005	C19011	1
C23005	F18011	2
C23006	F19004	1
C23007	F15005	1
C23009	F20005	1
C23011	C21011	2
C23011	B22011	1
C23012	C28004	2
C23012	C10012	1
C23013	D29010	1
C23013	C23003	2
C23014	C23002	2
C23014	D29014	1
C23015	C23016	1
C23016	C23015	1
C24002	C22010	1
C24002	C19010	2
C24003	D18009	1
C24003	C05011	2
C24004	E16007	1
C24004	D15010	2
C24005	F23007	1
C24006	E16005	1
C24007	E05011	1
C24009	C25010	1
C24010	E15013	2
C24011	C22006	2
C24014	C03014	2
C24015	C24016	1
C24016	C24015	1
C25002	JD31028	1
C25003	E13010	1
C25004	D24004	1
C25005	D24005	1
C25006	B26002	2
C25006	E12003	1
C25007	C26003	1
C25009	C23002	1
C25010	C24009	1
C25011	B26003	1
C25012	JC31037	1
C25013	A26002	1
C25014	A14005	1
C25015	C25016	1
C25016	C25015	1
C26002	F13009	1
C26003	C25007	1
C26003	F13003	2
C26004	C21013	2
C26005	C27011	1
C26005	C26014	2
C26007	D15003	1
C26008	C26013	1
C26009	C19006	1
C26010	E11002	1
C26011	D23002	2
C26012	F08007	1
C26012	A25005	2
C26013	C26008	1
C26014	C26005	2
C26014	D29002	1
C26015	C26016	1
C26016	C26015	1
C27002	D21013	1
C27003	B26004	1
C27004	B22010	1
C27005	C28013	1
C27005	C27011	2
C27007	B27006	1
C27009	B27005	1
C27010	B27003	1
C27011	C27005	2
C27011	C26005	1
C27012	E15009	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			16	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C27013	F13004	1	
C27014	B26007	1	
C27015	C27016	1	
C27016	C27015	1	
C28002	E15010	2	
C28002	A25011	1	
C28003	F25003	1	
C28004	B30010	1	
C28004	C23012	2	
C28005	C30011	2	
C28005	C28012	1	
C28007	C28011	1	
C28010	B26011	1	
C28011	C28007	1	
C28012	C28005	1	
C28012	C28013	2	
C28013	C28012	2	
C28013	C27005	1	
C28014	B22014	2	
C28014	E24009	1	
C28015	C28016	1	
C28016	C28015	1	
C29002	C30009	1	
C29003	C29013	2	
C29004	A25007	1	
C29005	D28007	1	
C29005	C30014	2	
C29006	D27003	1	
C29007	D27013	1	
C29009	D27014	1	
C29010	D27006	1	
C29011	D28009	1	
C29011	F05010	2	
C29012	A25009	1	
C29013	D18013	1	
C29013	C29003	2	
C29014	F10009	1	
C29015	C29016	1	
C29016	C29015	1	
C30002	F29014	1	
C30002	A25002	2	
C30003	C15012	1	
C30003	C30004	2	
C30004	C30003	2	
C30004	C30011	1	
C30005	B24004	1	
C30006	D26002	1	
C30007	D19014	1	
C30009	C29002	1	
C30011	C30004	1	
C30011	C28005	2	
C30012	B25012	1	
C30013	C17009	1	
C30013	B27010	2	
C30014	C29005	2	
C30015	C30016	1	
C30016	C30015	1	
C31026	C31027	1	
C31027	C31026	1	
C31027	C31028	2	
C31028	C31027	2	
C31028	C31030	1	
C31030	C31028	1	
C31030	C31038	2	
C31038	C31030	2	
C31038	C31046	1	
C31046	C31038	1	
C31046	C05008	2	
D01002	D06015	1	
D01003	JE31025	1	
D01004	D06001	1	
D01005	JE31002	1	
D01006	D07015	1	
D01007	JE31006	1	
D01009	JE31009	1	
D01010	D07001	1	
D01011	JE31013	1	
D01012	D08015	1	
D01013	JE31040	1	
D01014	D08001	1	
D01015	D01016	1	
D01016	D01015	1	
D02002	D09015	1	
D02003	JE31042	1	
D02004	D09001	1	
D02005	JE31022	1	
D02006	D10015	1	
D02007	JD31025	1	
D02008	D02012	2	
D02008	D31030	1	
D02009	JD31003	1	
D02010	D10001	1	
D02011	JD31004	1	
D02012	D02008	2	
D02015	D02016	1	
D02016	D02015	1	
D03001	D03008	1	
D03002	D03003	2	
D03002	F21002	1	
D03003	D03010	1	
D03003	D03002	2	
D03004	B11010	1	
D03005	F08012	1	
D03006	D04015	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			17	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	D03007	D04002	2
	D03008	D03001	1
	D03009	A24005	1
	D03010	D05003	2
	D03010	D03003	1
	D03011	D14002	1
	D03012	C08011	1
	D03013	D12013	1
	D03013	D13013	2
	D03014	D04013	2
	D03015	D04004	2
	D04001	D04002	1
	D04002	D04001	1
	D04002	D03007	2
	D04003	D04004	1
	D04004	D04003	1
	D04004	D03015	2
	D04005	D04006	1
	D04005	D05007	2
	D04006	D04005	1
	D04007	D04008	1
	D04008	D04007	1
	D04008	D05015	2
	D04009	D05014	1
	D04010	D04012	1
	D04011	D05006	1
	D04012	D04010	1
	D04012	D04014	2
	D04013	B21009	1
	D04013	D03014	2
	D04014	D04012	2
	D04014	D04016	1
	D04015	D03006	1
	D04016	D04014	1
	D05001	F25009	1
	D05001	C01003	2
	D05002	E21012	1
	D05003	D05011	1
	D05003	D03010	2
	D05004	C01010	1
	D05006	D04011	1
	D05007	D04005	2
	D05008	D05009	1
	D05009	D05008	1
	D05010	E11013	2
	D05010	D25014	1
	D05011	D14005	2
	D05011	D05003	1
	D05012	E11012	1
	D05014	D04009	1
	D05015	D04008	2
	D06001	D01004	1
	D06003	D12004	2
	D06003	D07003	1
	D06004	E08013	1
	D06004	B14004	2
	D06005	E07010	2
	D06005	B14005	1
	D06006	D21010	2
	D06007	B29013	2
	D06009	B29012	2
	D06010	E23014	1
	D06011	F16013	1
	D06011	B14011	2
	D06012	E08012	1
	D06012	B14012	2
	D06013	D12007	2
	D06013	D07013	1
	D06015	D01002	1
	D07001	D01010	1
	D07003	D06003	1
	D07003	D08003	2
	D07004	E08015	1
	D07004	B13004	2
	D07005	E06009	1
	D07005	B13005	2
	D07006	E23011	1
	D07007	B28011	2
	D07007	F20002	1
	D07009	B28010	2
	D07010	D21006	2
	D07011	E07003	2
	D07011	B13011	1
	D07012	E08014	1
	D07012	B13012	2
	D07013	D06013	1
	D07013	D08013	2
	D07015	D01006	1
	D08001	D01014	1
	D08003	D07003	2
	D08003	D09003	1
	D08004	E09013	1
	D08004	B12004	2
	D08005	D08008	1
	D08006	F20004	2
	D08007	C10013	1
	D08007	E30002	2
	D08008	D08005	1
	D08009	B28012	2
	D08009	F10006	1
	D08010	D21004	2
	D08011	F16009	1
	D08011	B12011	2
	D08012	E09012	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			18	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	D08012	B12012	2
	D08013	D07013	2
	D08013	D09013	1
	D08015	D01012	1
	D09001	D02004	1
	D09003	D08003	1
	D09003	D10003	2
	D09004	E09015	1
	D09004	B11004	2
	D09005	F29010	1
	D09006	E22011	1
	D09007	F27014	1
	D09009	F27015	1
	D09010	D25010	2
	D09011	F29007	2
	D09012	E09014	1
	D09012	B11012	2
	D09013	D08013	1
	D09013	D10013	2
	D09015	D02002	1
	D10001	D02010	1
	D10003	D09003	2
	D10004	E10013	1
	D10004	B20004	2
	D10005	F29013	1
	D10006	D25012	2
	D10007	D10008	1
	D10008	D10007	1
	D10008	D10009	2
	D10009	D10008	2
	D10010	D25011	2
	D10011	F29003	1
	D10012	E10012	1
	D10012	B20012	2
	D10013	D09013	2
	D10015	D02006	1
	D11001	E10009	1
	D11003	F28005	2
	D11004	E05002	2
	D11005	D11006	1
	D11006	D11007	2
	D11006	D11005	1
	D11007	D11009	1
	D11007	D11006	2
	D11008	D11013	1
	D11009	D11010	2
	D11009	D11007	1
	D11010	D11011	1
	D11010	D11009	2
	D11011	E25005	2
	D11011	D11010	1
	D11012	E05003	2
	D11013	D11008	1
	D11015	E10007	1
	D12002	JD31017	1
	D12003	D12005	2
	D12004	D06003	2
	D12005	D16004	1
	D12005	D12003	2
	D12006	JD31037	1
	D12007	D06013	2
	D12009	F05003	1
	D12010	C04011	2
	D12011	C07013	1
	D12012	E05014	1
	D12013	D03013	1
	D12013	D20004	2
	D12014	F21004	1
	D12015	D12016	1
	D12016	D12015	1
	D13002	E16006	2
	D13002	C05005	1
	D13003	D20004	1
	D13003	E19011	2
	D13004	D13005	1
	D13005	D13004	1
	D13006	F30003	1
	D13007	E10011	1
	D13009	D14014	1
	D13010	D19009	1
	D13010	C16003	2
	D13011	D20006	1
	D13011	F29014	2
	D13012	B21012	1
	D13013	D03013	2
	D13014	D14007	1
	D13014	C02010	2
	D13015	D13016	1
	D13016	D13015	1
	D14002	D14003	2
	D14002	D03011	1
	D14003	D18003	1
	D14003	D14002	2
	D14004	A24012	1
	D14005	D14011	1
	D14005	D05011	2
	D14006	C05010	2
	D14007	D13014	1
	D14010	C20011	1
	D14011	D29011	2
	D14011	D14005	1
	D14012	C09004	2
	D14012	F08005	1
	D14013	C21003	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	D14013	E15014	2
	D14014	D13009	1
	D14014	D20002	2
	D14015	D14016	1
	D14016	D14015	1
	D15002	D17009	1
	D15003	C26007	1
	D15004	C18012	1
	D15005	D17013	1
	D15005	B22002	2
	D15006	B23003	2
	D15007	D19013	1
	D15009	E07014	2
	D15009	D15012	1
	D15010	C24004	2
	D15011	C19004	1
	D15011	D16006	2
	D15012	D15009	1
	D15013	D15014	2
	D15014	F16015	1
	D15014	D15013	2
	D15015	D15016	1
	D15016	D15015	1
	D16002	F23010	1
	D16003	F25007	1
	D16004	D12005	1
	D16005	D17003	1
	D16006	D15011	2
	D16007	C16005	1
	D16009	C10004	1
	D16010	C13009	1
	D16011	C02004	1
	D16011	E14004	2
	D16012	E18002	1
	D16013	E24013	1
	D16014	E18001	2
	D16015	D16016	1
	D16016	D16015	1
	D17002	F16014	1
	D17003	D16005	1
	D17006	C20013	1
	D17007	C09013	1
	D17009	D15002	1
	D17010	C17004	1
	D17011	B27014	1
	D17012	JE31045	1
	D17013	D15005	1
	D17014	F09012	1
	D17015	D17016	1
	D17016	D17015	1
	D18002	D20013	1
	D18003	D14003	1
	D18004	C01004	1
	D18005	A25003	1
	D18006	B27009	1
	D18007	D18014	1
	D18009	C24003	1
	D18010	C13003	1
	D18011	E15003	2
	D18012	JC31014	1
	D18012	C12011	2
	D18013	C29013	1
	D18014	D18007	1
	D18015	D18016	1
	D18016	D18015	1
	D19002	D27009	1
	D19002	C01013	2
	D19003	A12010	1
	D19003	E30010	2
	D19004	C18004	2
	D19004	F08013	1
	D19009	D13010	1
PE54018			
	D19010	A13005	1
	D19010	D19011	2
	D19011	D19010	2
	D19011	E30014	1
	D19012	D19013	2
	D19012	JE31020	1
	D19013	D15007	1
	D19013	D19012	2
	D19014	C30007	1
	D19015	D19016	1
	D19016	D19015	1
	D20002	D14014	2
	D20002	E12012	1
	D20003	C08002	1
	D20003	D20006	2
	D20004	D12013	2
	D20004	D13003	1
	D20005	A24013	1
	D20006	D20003	2
	D20006	D13011	1
	D20007	E20002	1
	D20009	B25002	1
	D20010	E20003	1
	D20011	C11015	2
	D20012	E18002	2
	D20013	D18002	1
PE54018	D20013	F22009	2
	D20014	JD31023	1
	D20015	D20016	1
	D20016	D20015	1
	D21002	E21013	1
	D21002	D24003	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			20	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
D21004	E22014	1
D21004	D08010	2
D21005	D24002	1
D21006	E23012	1
D21006	D07010	2
D21007	D23002	1
D21009	D23006	1
D21010	E23013	1
D21010	D06006	2
D21011	D24006	1
D21012	E24011	1
D21013	C27002	1
D21014	E19004	2
D21014	D24014	1
D21015	D21016	1
D21016	D21015	1
D22002	A19015	2
D22002	D22003	1
D22003	D22002	1
D22003	F01004	2
D22004	D22005	1
D22005	D22004	1
D22006	F25005	1
D22007	D22014	1
D22009	D22013	1
D22010	D29006	1
D22011	JC31036	1
D22011	F25004	2
D22012	E25002	2
D22013	D22009	1
D22014	D22007	1
D22015	D22016	1
D22016	D22015	1
D23002	D21007	1
D23002	C26011	2
D23003	D23005	2
D23004	D23010	1
D23005	D25009	1
D23005	D23003	2
D23006	D21009	1
D23007	D23013	1
D23009	C22014	1
D23010	D23004	1
D23011	D23014	2
D23012	C21014	1
D23013	D23007	1
D23013	F13011	2
D23014	C19007	1
D23014	D23011	2
D23015	D23016	1
D23016	D23015	1
D24002	D21005	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
D24003	D21002	2
D24003	D25012	1
D24004	C25004	1
D24005	C25005	1
D24005	D24013	2
D24006	D21011	1
D24007	C21012	1
D24009	C19013	1
D24010	D25007	1
D24011	C22013	2
D24012	C22012	1
D24013	D24005	2
D24014	D21014	1
D24015	D24016	1
D24016	D24015	1
D25002	B18002	2
D25002	F30006	1
D25003	E13012	1
D25004	B22013	1
D25005	C05009	1
D25005	D25006	2
D25006	D25005	2
D25006	C06014	1
D25007	D24010	1
D25009	D23005	1
D25010	E22012	1
D25010	D09010	2
D25011	E21014	1
D25011	D10010	2
D25012	D24003	1
D25012	D10006	2
D25013	B17011	1
D25014	D05010	1
D25015	D25016	1
D25016	D25015	1
D26002	C30006	1
D26003	JD31024	1
D26004	D27013	2
D26005	JD31006	1
D26006	D27014	2
D26007	JD31029	1
D26009	JE31035	1
D26010	F25011	1
D26011	JE31015	1
D26012	F25013	1
D26013	JE31019	1
D26014	F19003	1
D26015	D26016	1
D26016	D26015	1
D27002	JD31035	1
D27002	D28006	2
D27003	C29006	1

TITLE: LOGIC BOARD WIRE WRAP (TB304B/C)	WL	DOCUMENT NO.	SHEET NO. 21	REV. D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
D27004	D27011	1
D27005	JD31013	1
D27005	D28010	2
D27006	C29010	1
D27007	D27010	1
D27009	D19002	1
D27010	D27007	1
D27011	D27004	1
D27012	F29009	1
D27013	C29007	1
D27013	D26004	2
D27014	C29009	1
D27014	D26006	2
D27015	D27016	1
D27016	D27015	1
D28002	A25004	1
D28002	D28003	2
D28003	D28002	2
D28003	D28004	1
D28004	D28003	1
D28004	D28014	2
D28005	C20010	2
D28005	D28011	1
D28006	D27002	2
D28007	C29005	1
D28009	C29011	1
D28010	D27005	2
D28010	F19014	1
D28011	D28005	1
D28011	E11004	2
D28014	D28004	2
D28015	D28016	1
D28016	D28015	1
D29002	C26014	1
D29002	D29005	2
D29003	D29007	1
D29004	D30009	1
D29005	D29002	2
D29005	D29011	1
D29006	D22010	1
D29007	D29003	1
D29009	E29011	1
D29010	C23013	1
D29011	D29005	1
D29011	D14011	2
D29012	C23004	2
D29012	B26013	1
D29013	D29014	2
D29013	F20006	1
D29014	C23014	1
D29014	D29013	2
D29015	D29016	1
D29016	D29015	1
D30009	D29004	1
D30015	D30016	1
D30016	D30015	1
D31030	D31038	2
D31030	D02008	1
D31038	D31046	1
D31038	D31030	2
D31046	D31038	1
E01001	F23009	1
E01001	E02001	2
E01003	E01004	1
E01004	E01007	2
E01004	E01003	1
E01005	E02003	1
E01006	C12009	1
E01007	E13004	1
E01007	E01004	2
E01009	E09007	2
E01010	E08003	2
E01010	F26013	1
E01011	E08004	2
E01011	F26014	1
E01012	E08009	2
E01013	E08007	2
E01014	F28010	1
E02001	E01001	2
E02001	C05006	1
E02003	E02007	2
E02003	E01005	1
E02004	E13011	2
E02004	F16003	1
E02005	E20011	1
E02006	E15004	1
E02007	E15003	1
E02007	E02003	2
E02009	E05002	1
E02010	E05003	1
E02011	E09003	2
E02012	E09004	2
E02013	E09009	2
E02014	F28011	1
E03001	JE31004	1
E03001	E08005	2
E03002	E08009	1
E03003	E08007	1
E03004	C05007	1
E03005	C17012	1
E03006	E08004	1
E03007	E08003	1
E03009	JE31011	1
E03009	E08002	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			22	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E03010	JE31032		1
E03010	E08001		2
E03011	E04011		1
E03012	E04005		1
E03013	E04004		1
E03014	E04014		1
E03014	F17004		2
E03015	JE31027		1
E03015	E08006		2
E04001	JE31017		1
E04001	E09005		2
E04002	E09009		1
E04003	E09007		1
E04004	E03013		1
E04005	E03012		1
E04006	E09004		1
E04007	E09003		1
E04008	E31046		1
E04009	JD31001		1
E04009	E09002		2
E04010	JE31021		1
E04010	E09001		2
E04011	E05011		2
E04011	E03011		1
E04012	E05005		1
E04013	E05004		1
E04014	E05014		2
F04014	E03014		1
E04015	JE31014		1
E04015	E09006		2
E05001	JD31010		1
E05001	E10005		2
E05002	E02009		1
E05002	D11004		2
E05003	E02010		1
E05003	D11012		2
E05004	E04013		1
E05005	E04012		1
E05008	E05009		1
E05009	E05008		1
E05009	E05010		2
E05010	E05009		2
E05011	C24007		1
E05011	E04011		2
E05013	F23006		1
E05014	D12012		1
E05014	E04014		2
E05015	JD31027		1
E05015	E10006		2
F06002	E07002		2
E06004	E06008		1
F06005	JE31037		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E06006	E06007		1
E06007	E06006		1
E06007	F16009		2
E06008	E06004		1
E06008	E06011		2
E06009	E07013		2
E06009	D07005		1
E06011	E06008		2
E06011	E06012		1
E06012	E06011		1
E06014	C11004		2
E06014	E07014		1
E06015	E06016		1
E06016	E06015		1
E07002	C03009		1
E07002	E06002		2
E07003	F16011		1
E07003	D07011		2
E07004	JE31033		1
E07005	JE31028		1
E07006	E07007		1
E07007	E07006		1
E07007	F16013		2
F07009	F20009		1
E07010	F16012		1
E07010	D06005		2
E07011	JE31005		1
E07012	JE31012		1
E07013	E06009		2
E07013	F16010		1
E07014	D15009		2
F07014	E06014		1
E07015	E07016		1
F07016	E07015		1
E08001	E03010		2
F08002	E03009		2
E08003	E03007		1
E08003	E01010		2
E08004	E03006		1
E08004	E01011		2
E08005	E03001		2
E08006	E03015		2
E08007	E03003		1
E08007	E01013		2
F08009	E03002		1
E08009	E01012		2
E08010	F23012		1
E08010	E09010		2
F08011	E09011		1
E08012	D06012		1
F08013	D06004		1
E08014	D07012		1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			23	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E08015	D07004	1	
E09001	E04010	2	
E09002	E04009	2	
E09003	E04007	1	
E09003	E02011	2	
E09004	E04006	1	
E09004	E02012	2	
E09005	E04001	2	
E09006	E04015	2	
E09007	E04003	1	
E09007	E01009	2	
E09009	E04002	1	
E09009	E02013	2	
E09010	E08010	2	
E09010	E10010	1	
E09011	E10011	2	
E09011	E08011	1	
E09012	D08012	1	
E09013	D08004	1	
E09014	D09012	1	
E09015	D09004	1	
E10001	E10002	1	
E10002	E10001	1	
E10002	E10003	2	
F10003	E10002	2	
E10003	E10004	1	
E10004	E10003	1	
E10004	E10008	2	
E10005	E05001	2	
E10006	E05015	2	
E10007	D11015	1	
E10008	E10004	2	
E10009	D11001	1	
E10010	E09010	1	
E10011	D13007	1	
E10011	E09011	2	
E10012	D10012	1	
F10013	D10004	1	
E11002	C26010	1	
F11003	E12003	2	
E11004	D28011	2	
E11004	F13013	1	
E11005	C15011	2	
E11005	E18003	1	
E11007	E12005	1	
E11009	E29002	1	
E11011	C07014	1	
E11011	F14011	2	
E11012	D05012	1	
E11013	E11014	1	
E11013	D05010	2	
F11014	F09010	2	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E11014	E11013	1	
E11015	E11016	1	
E11016	E11015	1	
E12002	JC31025	1	
E12003	C25006	1	
E12003	E11003	2	
E12004	C04012	1	
E12005	E11007	1	
E12005	F10003	2	
E12006	JC31001	1	
E12007	F05002	1	
E12009	F27001	1	
E12010	E12011	1	
E12011	C17002	2	
E12011	E12010	1	
E12012	D20002	1	
E12012	E24010	2	
E12013	F10002	1	
E12014	C04009	1	
E12015	E12016	1	
E12016	E12015	1	
E13002	E15002	2	
E13002	E13011	1	
F13003	E15006	2	
E13004	E01007	1	
E13005	E30006	2	
E13005	F26006	1	
F13006	F17003	2	
E13007	F16004	1	
F13009	F17005	1	
E13010	C25003	1	
E13011	E13002	1	
F13011	E02004	2	
F13012	D25003	1	
E13013	C13006	2	
E13013	F13010	1	
E13014	C14003	1	
F13014	F23010	2	
E13015	E13016	1	
F13016	E13015	1	
E14002	E23001	1	
E14002	E14005	2	
F14003	F05012	1	
E14004	D16011	2	
E14005	E14002	2	
E14005	E25005	1	
E14006	C12006	1	
E14010	B07002	1	
E14011	F28004	1	
F14011	C15001	2	
E14012	F21010	1	
E14012	E14013	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			24	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
E14013	E14012	2
E14014	A25012	1
E14015	E14016	1
E14016	E14015	1
E15002	E20004	1
E15002	E13002	2
E15003	D18011	2
E15003	E02007	1
E15004	E02006	1
E15005	E20005	1
E15005	F26003	2
E15006	C12011	1
E15006	E13003	2
E15007	E20012	1
E15009	C27012	1
E15010	F10013	1
E15010	C28002	2
E15011	JD31020	1
E15012	C17011	1
E15013	F05004	1
E15013	C24010	2
E15014	D14013	2
E15014	F05006	1
E15015	E15016	1
E15016	E15015	1
E16002	E17013	1
E16002	B18003	2
E16003	B16003	1
E16004	E17012	1
E16004	E19012	2
E16005	C24006	1
E16006	E17011	1
E16006	D13002	2
E16007	C24004	1
E16009	JF31003	1
E16010	E17010	1
E16010	F14014	2
E16011	C03011	1
E16012	E17009	1
E16013	F15014	1
E16013	A22010	2
E16014	E17005	1
E16014	C13005	2
E16015	E16016	1
E16016	E16015	1
E17001	E18012	1
E17002	B25004	1
E17005	E16014	1
E17005	F12006	2
E17009	E16012	1
E17010	E16010	1
E17011	E16006	1
E17012	E16004	1
E17013	E16002	1
E17014	E18013	1
E17015	E18014	1
E18001	E19006	1
E18001	D16014	2
E18002	D16012	1
E18002	D20012	2
E18003	E11005	1
E18003	E18004	2
E18004	E18003	2
E18004	E18005	1
E18005	E18004	1
E18005	E18006	2
E18006	E18005	2
E18006	E18007	1
E18007	E18006	1
E18007	E18009	2
E18009	E18007	2
E18009	E18010	1
E18010	E18009	1
E18010	E19014	2
E18012	E17001	1
E18013	E17014	1
E18014	E17015	1
E19002	E19005	2
E19002	E25001	1
E19003	C09012	2
E19004	E24012	1
E19004	D21014	2
E19005	E19014	1
E19005	E19002	2
E19006	E18001	1
E19009	E19013	1
E19010	F23014	1
E19011	D13003	2
E19012	E16004	2
E19012	F24006	1
E19013	E19009	1
E19014	E18010	2
E19014	E19005	1
E19015	E19016	1
E19016	E19015	1
E20002	D20007	1
F20002	B16014	2
E20003	D20010	1
E20004	C12010	2
E20004	E15002	1
E20005	E15005	1
E20006	JC31010	1
E20007	C03002	1
E20009	C17014	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			25	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	E20010	B16007	1
	E20011	E02005	1
	E20012	E15007	1
	E20013	E28004	1
	E20014	F18014	1
	E20014	B16012	2
	E20015	E20016	1
	E20016	E20015	1
	E21001	E26006	2
	E21001	E22001	1
	E21002	E22002	2
	E21002	F30002	1
	E21003	E21004	1
	E21004	E21003	1
	E21004	E21005	2
	E21005	E21004	2
	E21005	E21006	1
	E21006	E21005	1
	E21006	E21008	2
	E21007	E22007	1
	E21008	E21006	2
	E21009	E22009	2
	E21010	E22015	1
	E21012	D05002	1
	E21013	D21002	1
	E21014	D25011	1
	E22001	E21001	1
	E22001	E23001	2
	E22002	E23002	1
	E22002	E21002	2
	E22003	E22004	1
	E22004	E22003	1
	E22004	E22005	2
	E22005	E22004	2
	E22005	E22006	1
	E22006	E22005	1
	E22006	E22008	2
	E22007	E23007	2
	E22007	E21007	1
	E22008	E22006	2
	E22009	E27001	1
	E22009	E21009	2
	E22010	E23015	1
	E22011	D09006	1
	E22012	D25010	1
	E22013	F20004	1
	E22014	D21004	1
	E22015	E21010	1
	E23001	E22001	2
	E23001	E14002	1
	E23002	E24002	2
	E23002	E22002	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	E23003	E23004	1
	E23004	E23003	1
	E23004	E23005	2
	E23005	E23004	2
	E23005	E23006	1
	E23006	E23005	1
	E23006	E23008	2
	E23007	E24015	1
	E23007	E22007	2
	E23008	E23006	2
	E23009	E24009	2
	E23009	E28011	1
	E23010	E24001	2
	E23010	E28014	1
	E23011	D07006	1
	E23012	D21006	1
	E23013	D21010	1
	E23014	D06010	1
	E23015	E22010	1
	E24001	E24003	1
	E24001	E23010	2
	E24002	E25015	1
	E24002	E23002	2
	E24003	E25010	2
	E24003	E24001	1
	E24004	E24005	1
	E24005	E24004	1
	E24005	E24006	2
	E24006	E24005	2
	E24006	E24008	1
	E24007	E24010	1
	E24007	E29005	2
	E24008	E24006	1
	E24009	C28014	1
	E24009	E23009	2
	E24010	E12012	2
	E24010	E24007	1
	E24011	D21012	1
	E24012	E19004	1
	E24013	D16013	1
	E24014	F10014	1
	E24015	E23007	1
	E25001	E19002	1
	E25001	E25007	2
	E25002	D22012	2
	E25002	A22002	1
	E25003	E25004	1
	E25003	E25006	2
	E25004	E25003	1
	E25004	E25008	2
	E25005	E14005	1
	E25005	D11011	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			26	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E25006	E25003	2	
E25007	E25001	2	
E25007	E25010	1	
E25008	E25004	2	
E25009	F30004	1	
E25010	E25007	1	
E25010	E24003	2	
E25015	E24002	1	
E26001	F13012	1	
E26002	C10012	2	
E26002	F27010	1	
E26003	C09005	2	
E26003	E26004	1	
E26004	E26003	1	
E26004	E26005	2	
E26005	E26004	2	
E26005	E26006	1	
E26006	E26005	1	
E26006	E21001	2	
E26007	C23003	1	
E26007	F13006	2	
E26009	E29009	1	
E26010	E27010	2	
E26010	F29002	1	
E26012	F18010	1	
E26013	B16011	1	
E26014	B16010	1	
E27001	E28011	2	
E27001	E22009	1	
E27002	F19009	1	
E27002	E28012	2	
E27003	E28005	1	
F27003	E27009	2	
E27004	E27005	1	
E27005	E27004	1	
E27005	E27006	2	
E27006	E27005	2	
E27006	E27008	1	
E27007	E29012	2	
E27007	F08003	1	
E27008	E27006	1	
E27009	E27003	2	
E27009	E27010	1	
E27010	E27009	1	
E27010	E26010	2	
E27013	E29013	1	
E27014	E29014	1	
E28002	B25010	2	
F28002	E28003	1	
E28003	E28002	1	
E28003	JF31024	2	
E28004	E20013	1	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E28005	E28014	2	
E28005	E27003	1	
E28006	F18002	1	
E28009	B27013	1	
E28011	E23009	1	
E28011	E27001	2	
E28012	E27002	2	
E28013	A25011	2	
E28014	E23010	1	
E28014	E28005	2	
F28015	E28016	1	
E28016	E28015	1	
E29002	E11009	1	
E29003	F14009	1	
E29004	F18005	1	
E29005	E24007	2	
E29006	B27002	2	
E29007	F24003	1	
E29009	E26009	1	
E29010	F10007	1	
E29010	C16011	2	
E29011	D29009	1	
E29011	F20003	2	
E29012	E27007	2	
E29013	E27013	1	
E29013	A27003	2	
E29014	E27014	1	
E29014	A27013	2	
E29015	E29016	1	
E29016	E29015	1	
E30002	D08007	2	
F30002	F27003	1	
E30003	F10005	1	
E30004	B16009	1	
E30004	F08004	2	
E30005	F15004	1	
E30006	JC31018	1	
E30006	E13005	2	
E30007	F26002	1	
E30009	C18002	1	
E30010	D19003	2	
E30013	C18006	1	
E30014	D19011	1	
F30015	E30016	1	
E30016	E30015	1	
E31030	E3103B	1	
E31038	E31030	1	
E3103B	E31046	2	
E31046	E3103B	2	
F31046	E0400B	1	
F01002	B24014	2	
F01003	B18011	1	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
F01004	D22003	2
F01005	JF31007	2
F01006	F03013	1
F01007	F04009	1
F01008	F04007	1
F01009	F04005	1
F01010	F03007	1
F01011	F03009	1
F01012	F01015	2
F01013	F01014	1
F01013	F02008	2
F01014	F06007	2
F01014	F01013	1
F01015	C20005	1
F01015	F01012	2
F02002	B06003	1
F02003	F06008	1
F02004	C10009	1
F02005	F06013	1
F02008	F01013	2
F02015	F02016	1
F02016	F02015	1
F03002	B11014	1
F03003	F06003	1
F03004	B11002	1
F03005	F06002	1
F03006	B20014	1
F03007	F01010	1
F03009	F01011	1
F03010	B20002	1
F03011	F06006	1
F03012	B09006	1
F03012	JF31001	2
F03013	F01006	1
F03014	JF31002	2
F03015	F03016	1
F03016	F03015	1
F04002	B14014	1
F04003	F06015	1
F04004	B14002	1
F04005	F01009	1
F04006	B13014	1
F04007	F01008	1
F04008	F31036	1
F04009	F01007	1
F04010	B13002	1
F04011	F06004	1
F04012	B12014	1
F04013	F06005	1
F04014	B12002	1
F04015	F04016	1
F04016	F04015	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
F05002	E12007	1
F05003	D12009	1
F05004	E15013	1
F05005	C04014	2
F05006	E15014	1
F05007	C09002	1
F05008	F31046	1
F05009	F09014	1
F05010	C29011	2
F05011	F19013	1
F05012	E14003	1
F05013	C06007	1
F05014	C13002	2
F05015	F05016	1
F05016	F05015	1
F06002	F03005	1
F06003	F03003	1
F06004	F04011	1
F06005	F04013	1
F06006	F03011	1
F06007	F01014	2
F06008	F02003	1
F06013	F02005	1
F06015	F04003	1
F08002	F27009	2
F08002	F08011	1
F08003	E27007	1
F08003	F10013	2
F08004	E30004	2
F08005	D14012	1
F08007	C26012	1
F08010	F09013	1
F08011	F29002	2
F08011	F08002	1
F08012	D03005	1
F08013	D19004	1
F08013	F08014	2
F08014	F08013	2
F08015	F08016	1
F08016	F08015	1
F09002	F15014	2
F09003	JC31013	1
F09003	F18003	2
F09004	F14002	1
F09005	C07003	2
F09006	JD31009	1
F09007	F24011	1
F09009	F23002	1
F09010	F14007	1
F09010	E11014	2
F09011	C07010	1
F09011	F24010	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			28	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	F09012	D17014	1
	F09013	F08010	1
	F09013	B24002	2
	F09014	F05009	1
	F09015	F09016	1
	F09016	F09015	1
	F10002	E12013	1
	F10003	E12005	2
	F10004	F15003	1
	F10005	E30003	1
	F10006	D08009	1
	F10006	F20014	2
	F10007	E29010	1
	F10009	C29014	1
	F10010	B27004	1
	F10011	F20007	1
	F10012	B22012	1
	F10013	F08003	2
	F10013	E15010	1
	F10014	E24014	1
	F10015	F10016	1
	F10016	F10015	1
	F12002	F16003	2
	F12003	JD31005	1
	F12004	F26010	1
	F12006	E17005	2
	F12009	B14009	1
	F12010	F21005	2
	F12011	B07007	1
	F12015	F12016	1
	F12016	F12015	1
	F13002	B26003	2
	F13003	C26003	2
	F13004	C27013	1
	F13005	F18011	1
	F13006	E26007	2
	F13007	C16010	1
	F13009	C26002	1
	F13010	E13013	1
	F13011	D23013	2
	F13012	E26001	1
	F13013	E11004	1
	F13013	JF31006	2
	F13014	F19005	1
	F13015	F13016	1
	F13016	F13015	1
	F14002	F09004	1
	F14003	F14013	2
	F14003	C03005	1
	F14004	C07012	1
	F14004	F18006	2
	F14005	F14014	1
	F14007	F09010	1
	F14009	E29003	1
	F14011	E11011	2
	F14012	A22012	1
	F14013	F24009	1
	F14013	F14003	2
	F14014	E16010	2
	F14014	F14005	1
	F14015	F14016	1
	F14016	F14015	1
	F15002	C02009	1
	F15003	F10004	1
	F15003	F15006	2
	F15004	E30005	1
	F15004	A25010	2
	F15005	C23007	1
	F15006	F15003	2
	F15006	C03014	1
	F15007	B30009	1
	F15009	C08014	1
	F15010	B26006	2
	F15010	F15011	1
	F15011	F15010	1
	F15014	E16013	1
	F15014	F09002	2
	F15015	F15016	1
	F15016	F15015	1
	F16001	F16006	1
	F16003	E02004	1
	F16003	F12002	2
	F16004	E13007	1
	F16005	F26007	1
	F16006	F16008	2
	F16006	F16001	1
	F16007	F26004	1
	F16008	F16006	2
	F16009	E06007	2
	F16009	D08011	1
	F16010	E07013	1
	F16011	E07003	1
	F16012	E07010	1
	F16013	E07007	2
	F16013	D06011	1
	F16014	D17002	1
	F16015	D15014	1
	F17002	F26009	1
	F17003	F17007	1
	F17003	E13006	2
	F17004	E03014	2
	F17005	E13009	1
	F17006	F28005	1
	F17007	F17003	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	F17010	B16006	1
	F17011	F21003	1
	F17011	F17014	2
	F17012	F30010	1
	F17013	F19006	2
	F17014	F17011	2
	F17015	F17016	1
	F17016	F17015	1
	F18002	E28006	1
	F18003	F09003	2
	F18003	F25010	1
	F18004	F18005	2
	F18005	E29004	1
	F18005	F18004	2
	F18006	F14004	2
	F18007	F19006	1
	F18009	F19010	1
	F18010	E26012	1
	F18010	F18014	2
	F18011	C23005	2
	F18011	F13005	1
	F18014	F18010	2
	F18014	E20014	1
	F18015	F18016	1
	F18016	F18015	1
	F19002	A13010	1
	F19003	D26014	1
	F19004	C23006	1
	F19005	F13014	1
	F19006	F18007	1
	F19006	F17013	2
	F19007	C11005	1
	F19009	E27002	1
	F19010	F18009	1
	F19011	F21009	1
	F19012	C05004	1
	F19013	F05011	1
	F19014	D28010	1
	F19015	F19016	1
	F19016	F19015	1
	F20002	D07007	1
	F20003	E29011	2
	F20003	B26014	1
	F20004	E22013	1
	F20004	D08006	2
	F20005	C23009	1
	F20006	D29013	1
	F20007	F10011	1
	F20009	E07009	1
	F20010	JE31044	1
	F20010	C19003	2
	F20011	C20012	1
	F20012	B17003	1
	F20013	F25002	1
	F20014	F10006	2
	F20015	F20016	1
	F20016	F20015	1
	F21001	F28007	2
	F21001	C11010	1
	F21002	D03002	1
	F21002	F21003	2
	F21003	F21002	2
	F21003	F17011	1
	F21004	D12014	1
	F21005	F28002	1
	F21005	F12010	2
	F21006	F22015	1
	F21007	F22002	2
	F21009	F19011	1
	F21009	A25013	2
	F21010	F21011	2
	F21010	E14012	1
	F21011	C15006	1
	F21011	F21010	2
	F21012	F30014	1
	F21014	F22013	1
	F21015	F22004	2
	F22001	F22002	1
	F22002	F22001	1
	F22002	F21007	2
	F22003	F22004	1
	F22004	F22003	1
	F22004	F21015	2
PE54029	F22007	F22008	1
PE54029	F22008	F22007	1
PE54018	F22009	D20013	2
PE54029	F22010	F26012	2
	F22013	F21014	1
	F22014	F22016	1
	F22015	F21006	1
	F22016	F22014	1
	F23002	F09009	1
	F23002	F24013	2
	F23003	C07007	1
	F23004	B13010	1
	F23005	JC31007	1
	F23005	F23011	2
	F23006	E05013	1
	F23007	C24005	1
	F23009	E01001	1
	F23010	E13014	2
	F23010	D16002	1
	F23011	F23005	2
	F23012	E08010	1
	F23013	JC31032	1
	F23014	E19010	1
	F23015	F23016	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			30	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	F23016	F23015	1
	F24002	B25009	1
	F24003	E29007	1
	F24004	JF31009	1
	F24005	JC31029	1
	F24006	E19012	1
	F24007	C17013	1
	F24009	F14013	1
	F24010	F09011	2
	F24011	F09007	1
	F24011	C07013	2
	F24012	B13006	1
	F24013	F23002	2
	F24014	C07006	1
	F24015	F24016	1
	F24016	F24015	1
	F25002	F20013	1
	F25003	C28003	1
	F25004	D22011	2
	F25005	D22006	1
	F25006	JD31040	1
	F25007	D16003	1
	F25009	D05001	1
	F25010	F18003	1
	F25011	D26010	1
	F25012	A19012	2
	F25013	D26012	1
	F25014	A19014	2
	F25015	F25016	1
	F25016	F25015	1
	F26002	E30007	1
	F26003	E15005	2
	F26003	F26005	1
	F26004	F16007	1
	F26005	F26003	1
	F26006	E13005	1
	F26007	F16005	1
	F26009	F17002	1
	F26010	F12004	1
	F26011	C05010	1
	F26011	C07014	2
PE54029	F26012	F22010	2
	F26012	F28006	1
	F26013	E01010	1
	F26014	E01011	1
	F26015	F26016	1
	F26016	F26015	1
	F27001	E12009	1
	F27001	B30001	2
	F27002	F27003	2
	F27003	E30002	1
	F27003	F27002	2
	F27009	F08002	2
	F27010	E26002	1
	F27014	D09007	1
	F27015	D09009	1
	F28002	F21005	1
	F28003	B16003	2
	F28004	E14011	1
	F28005	F17006	1
	F28005	D11003	2
	F28006	F26012	1
	F28007	F28009	1
	F28007	F21001	2
	F28009	F28007	1
	F28010	E01014	1
	F28011	E02014	1
	F28015	F28016	1
	F28016	F28015	1
	F29002	E26010	1
	F29002	F08011	2
	F29003	D10011	1
	F29004	F29005	1
	F29005	F29004	1
	F29005	F29008	2
	F29006	F29007	1
	F29007	F29006	1
	F29007	D09011	2
	F29008	F29005	2
	F29008	F29011	1
	F29009	D27012	1
	F29010	D09005	1
	F29011	F29008	1
	F29011	F29012	2
	F29012	F29011	2
	F29013	D10005	1
	F29014	D13011	2
	F29014	C30002	1
	F29015	F29016	1
	F29016	F29015	1
	F30002	E21002	1
	F30002	F30003	2
	F30003	F30002	2
	F30003	D13006	1
	F30004	E25009	1
	F30005	F30014	2
	F30005	A25014	1
	F30006	D25002	1
	F30007	B20013	1
	F30009	C16002	2
	F30010	F30011	2
	F30010	F17012	1
	F30011	JF31010	1
	F30011	F30010	2
	F30012	B20003	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
F30013	B18007	1
F30014	F21012	1
F30014	F30005	2
F30015	F30016	1
F30016	F30015	1
F31026	F31027	1
F31027	F31026	1
F31027	F31028	2
F31028	F31027	2
F31028	F31030	1
F31030	F31028	1
F31030	F31032	2
F31032	F31030	2
F31032	F31033	1
F31033	F31032	1
F31033	F31034	2
F31034	F31033	2
F31034	F31035	1
F31035	F31034	1
F31035	F31036	2
F31036	F31035	2
F31036	F04008	1
F31037	F31038	1
F31038	F31037	1
F31038	F31040	2
F31040	F31038	2
F31040	F31041	1
F31041	F31040	1
F31041	F31042	2
F31042	F31041	2
F31042	F31043	1
F31043	F31042	1
F31043	F31044	2
F31044	F31043	2
F31044	F31045	1
F31045	F31044	1
F31045	F31046	2
F31046	F31045	2
F31046	F05008	1
JA31001	B06014	1
JA31002	A03001	1
JA31003	B06009	1
JA31004	B09009	1
JA31005	A02004	1
JA31006	B10014	1
JA31007	A08002	1
JA31009	JC31035	1
JA31009	JA31032	2
JA31010	A04003	1
JA31011	A03007	1
JA31012	B15014	1
JA31013	JA31037	1
JA31014	B15010	1
JA31015	A01001	1
JA31017	JA31037	2
JA31017	JA31041	1
JA31018	A02006	1
JA31019	A02007	1
JA31020	JA31041	2
JA31020	A05008	1
JA31021	A03006	1
JA31022	A01004	1
JA31023	A08004	1
JA31024	B06013	1
JA31025	A03002	1
JA31026	B06010	1
JA31027	B09010	1
JA31028	A02003	1
JA31029	B10013	1
JA31032	JA31009	2
JA31033	A04004	1
JA31034	A03008	1
JA31035	B15013	1
JA31036	B15009	1
JA31037	JA31017	2
JA31037	JA31013	1
JA31038	A01002	1
JA31040	A02005	1
JA31041	JA31017	1
JA31041	JA31020	2
JA31042	A02008	1
JA31043	A03005	1
JA31044	A01003	1
JA31045	A08003	1
JA31046	A08005	1
JB31001	B07009	1
JB31002	B08014	1
JB31003	B08009	1
JB31004	B09014	1
JB31005	A04002	1
JB31006	A02001	1
JB31007	A03003	1
JB31009	B10009	1
JB31010	A04007	1
JB31011	B07014	1
JB31012	B01014	1
JB31013	B01009	1
JB31014	B02014	1
JB31015	B02009	1
JB31017	B03014	1
JB31018	B03009	1
JB31019	B04014	1
JB31020	B04009	1
JB31021	B05014	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
JA31022	B05009		1
JA31023	A04006		1
JA31024	B07010		1
JA31025	B08013		1
JA31026	B08010		1
JA31027	B09013		1
JA3102A	A04001		1
JA31029	A02002		1
JA31030	A03004		1
JA31032	B10010		1
JA31033	A04008		1
JA31034	B07013		1
JA31035	B01013		1
JA31036	B01010		1
JA31037	B02013		1
JA3103A	B02010		1
JA31040	B03013		1
JA31041	B03010		1
JA31042	B04013		1
JA31043	B04010		1
JA31044	B05013		1
JA31045	B05010		1
JA31046	A04005		1
JC31001	E12006		1
JC31002	C03006		1
JC31003	C02006		1
JC31007	F23005		1
JC31009	C14005		1
JC31010	E20006		1
JC31012	B21004		1
JC31013	F09003		1
JC31013	A22009		2
JC31014	D18012		1
JC31018	E30006		1
JC31019	C12010		1
JC31020	B21002		1
JC31021	C05002		1
JC31022	B07006		1
JC31023	B08002		1
JC31024	B26002		1
JC31025	E12002		1
JC31029	F24005		1
JC31032	F23013		1
JC31035	JA31009		1
JC31036	D22011		1
JC31037	C25012		1
JC31040	B08006		1
JC31041	B09002		1
JC31042	JC31043		1
JC31043	B05012		2
JC31043	JC31042		1
JD31001	E04009		1
JD31003	D02009		1
JD31004	D02011		1
JD31005	F12003		1
JD31006	D26005		1
JD31009	F09006		1
JD31010	E05001		1
JD31011	C14013		1
JD31013	D27005		1
JD31014	C14011		1
JD31015	C02014		1
JD31017	D12002		1
JD31020	B17013		2
JD31020	E15011		1
JD31021	B17014		2
JD31022	B21006		1
JD31023	D20014		1
JD31024	D26003		1
JD31025	D02007		1
JD31027	E05015		1
JD31028	C25002		1
JD31029	D26007		1
JD31033	C07003		1
JD31035	D27002		1
JD31037	D12006		1
JD31040	F25006		1
JD31043	B21011		1
JD31044	B21010		1
JD31045	C06012		1
JE31001	C18013		1
JE31002	D01005		1
JE31003	A30007		1
JE31004	E03001		1
JE31005	E07011		1
JE31006	D01007		1
JE31007	A29009		1
JE31009	D01009		1
JE31010	A29007		1
JE31011	E03009		1
JE31012	E07012		1
JE31013	D01011		1
JE31014	E04015		1
JE31015	D26011		1
JE31017	E04001		1
JE31019	D26013		1
JE31020	D19012		1
JE31021	E04010		1
JE31022	D02005		1
JE31023	C02013		1
JE31024	C18005		1
JE31025	D01003		1
JE31026	A30009		1
JF31027	E03015		1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304B/C)			33	D

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
JF31028	E07005		1
JE31029	C18007		1
JE31032	E03010		1
JE31033	E07004		1
JE31034	C18003		1
JF31035	D26009		1
JE31036	A28009		1
JF31037	E06005		1
JE31040	D01013		1
JE31041	A28007		1
JE31042	D02003		1
JE31043	A27009		1
JE31044	F20010		1
JE31045	D17012		1
JF31001	F03012		2
JF31002	B06006		1
JF31002	F03014		2
JF31003	E16009		1
JF31003	C02005		2
JF31005	B05006		1
JF31006	F13013		2
JF31007	B26005		1
JF31007	F01005		2
JF31009	F24004		1
JF31009	B18013		2
JF31010	B15007		2
JF31010	F30011		1
JF31011	B03006		1
JF31012	B03002		1
JF31013	A26003		1
JF31014	B05002		1
JF31015	B04006		1
JF31017	B04002		1
JF31018	B23004		1
JF31019	B02006		1
JF31020	B01006		1
JF31022	B01002		1
JF31023	B02002		1
JF31024	E28003		2
JF31025	B14010		1
JF31029	B15003		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL

TB304A

WIRE LIST

TITLE LOGIC BOARD WIRE WRAP (TB304A) (REF: 83249904)	WL	DOCUMENT NO.	SHEET NO. 1 of 32	REV. A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
A01001	JA31015		1
A01001	A06010		2
A01002	JA3103R		1
A01002	A06009		2
A01003	JA31044		1
A01003	A06007		2
A01004	JA31027		1
A01004	A06006		2
A01013	A15012		1
A01014	A15013		1
A01015	A15003		1
A01016	A15002		1
A02001	JB31006		1
A02001	A07011		2
A02002	JB31029		1
A02002	A07012		2
A02003	JA3102R		1
A02003	A07013		2
A02004	JA31005		1
A02004	A07014		2
A02005	JA31040		1
A02005	A06002		2
A02006	JA3101R		1
A02006	A06003		2
A02007	JA31019		1
A02007	A06004		2
A02008	JA31042		1
A02008	A06005		2
A02009	A14012		1
A02010	A14013		1
A02011	A14003		1
A02012	A14002		1
A02013	A13012		1
A02014	A13013		1
A02015	A13003		1
A02016	A13002		1
A03001	JA31002		1
A03001	A07002		2
A03002	JA31025		1
A03002	A07003		2
A03003	JB31007		1
A03003	A07004		2
A03004	JB31030		1
A03004	A07005		2
A03005	JA31043		1
A03005	A07010		2
A03006	JA31021		1
A03006	A07009		2
A03007	JA31011		1
A03007	A07007		2
A03008	JA31034		1
A03008	A07006		2
A03009	A12012		1
A03010	A12013		1
A03011	A12003		1
A03012	A12002		1
A03013	A11012		1
A03014	A11013		1
A03015	A11003		1
A03016	A11002		1
A04001	JB3102R		1
A04001	A08002		2
A04002	JB31005		1
A04002	A08003		2
A04003	JA31010		1
A04003	A08004		2
A04004	JA31033		1
A04004	A08005		2
A04005	JB31046		1
A04005	A08010		2
A04006	JB31023		1
A04006	A08009		2
A04007	JB31010		1
A04007	A08007		2
A04008	JB31033		1
A04008	A08006		2
A04009	A10012		1
A04010	A10013		1
A04011	A10003		1
A04012	A10002		1
A04013	A05012		1
A04014	A05013		1
A04015	A05003		1
A04016	A05002		1
A05002	A04016		1
A05003	A04015		1
A05005	A19009		1
A05006	A05007		1
A05007	A05009		2
A05007	A05006		1
A05008	JA31020		1
A05009	A10006		1
A05009	A05007		2
A05010	A16012		1
A05012	A04013		1
A05013	A04014		1
A05014	A10014		1
A05015	A05016		1
A05016	A05015		1
A06002	A02005		2
A06003	A02006		2
A06004	A02007		2
A06005	A02008		2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			2	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	A06006	A01004	2
	A06007	A01003	2
	A06007	A09010	1
	A06009	A01002	2
	A06010	A01001	2
	A07002	A03001	2
	A07002	A09002	1
	A07003	A03002	2
	A07004	A03003	2
	A07004	A09003	1
	A07005	A03004	2
	A07006	A03008	2
	A07007	A03007	2
	A07007	A09004	1
	A07009	A03006	2
	A07009	A09005	1
	A07010	A03005	2
	A07011	A02001	2
	A07011	A09006	1
	A07012	A02002	2
	A07013	A02003	2
	A07013	A09007	1
	A07014	A02004	2
	A08002	A04001	2
	A08002	JA31007	1
	A08003	A04002	2
	A08003	JA31045	1
	A08004	A04003	2
	A08004	JA31023	1
	A08005	A04004	2
	A08005	JA31046	1
	A08006	A04008	2
	A08007	A04007	2
	A08007	A09001	1
	A08009	A04006	2
	A08010	A04005	2
	A09001	A08007	1
	A09002	A07002	1
	A09003	A07004	1
	A09004	A07007	1
	A09005	A07009	1
	A09006	A07011	1
	A09007	A07013	1
	A09010	A06007	1
	A10002	A04012	1
	A10003	A04011	1
	A10005	A19010	1
	A10006	A10007	2
	A10006	A05009	1
	A10007	A10009	1
	A10007	A10006	2
	A10009	A15006	2

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	A10009	A10007	1
	A10010	A19011	1
	A10012	A04009	1
	A10013	A04010	1
	A10014	A05014	1
	A10014	A15014	2
	A10015	A10016	1
	A10016	A10015	1
	A11002	A03016	1
	A11003	A03015	1
	A11005	A19012	1
	A11006	A11007	2
	A11006	A12009	1
	A11007	A11009	1
	A11007	A11006	2
	A11009	C01002	2
	A11009	A11007	1
	A11010	A19013	1
	A11012	A03013	1
	A11013	A03014	1
	A11014	A12014	2
	A11014	B15012	1
	A11015	A11016	1
	A11016	A11015	1
	A12002	A03012	1
	A12003	A03011	1
	A12005	C20006	1
	A12006	A12007	1
	A12006	A13009	2
	A12007	A12009	2
	A12007	A12006	1
	A12009	A11006	1
	A12009	A12007	2
	A12010	D19003	1
	A12012	A03009	1
	A12013	A03010	1
	A12014	A13014	1
	A12014	A11014	2
	A12015	A12016	1
	A12016	A12015	1
	A13002	A02016	1
	A13003	A02015	1
	A13005	D19010	1
	A13006	A13007	2
	A13006	A14009	1
	A13007	A13009	1
	A13007	A13006	2
	A13009	A12006	2
	A13009	A13007	1
	A13010	F19002	1
	A13012	A02013	1
	A13013	A02014	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			3	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
	A13014	A14014	2
	A13014	A12014	1
	A13015	A13016	1
	A13016	A13015	1
	A14002	A02012	1
	A14003	A02011	1
	A14005	C25014	1
	A14006	A14009	2
	A14006	A15009	1
	A14007	A25003	2
	A14007	C05013	1
	A14009	A13006	1
	A14009	A14006	2
	A14010	B25009	2
	A14012	A02009	1
	A14013	A02010	1
	A14014	A15014	1
	A14014	A13014	2
	A14015	A14016	1
	A14016	A14015	1
	A15002	A01016	1
	A15003	A01015	1
	A15005	A19015	1
	A15006	A15007	1
	A15006	A10009	2
	A15007	A15009	2
	A15007	A15006	1
	A15009	A14006	1
	A15009	A15007	2
	A15010	A19014	1
	A15012	A01013	1
	A15013	A01014	1
	A15014	A10014	2
	A15014	A14014	1
	A15015	A15016	1
	A15016	A15015	1
	A16004	A23010	2
	A16005	A21007	1
	A16006	A21009	2
	A16007	B18005	1
	A16011	B24011	1
	A16012	A05010	1
	A16012	A19001	2
	A16013	A17002	1
	A16014	B24007	1
	A16015	A16016	1
	A16016	A16015	1
	A17001	A18010	1
	A17002	A16013	1
	A17002	A18002	2
	A17003	A19004	2
	A17004	A19003	2
	A17005	A19002	2
	A17006	A20009	1
	A17006	C15007	2
	A17007	A18015	1
	A17007	A17010	2
	A17009	B22004	2
	A17009	A18009	1
	A17010	A17007	2
	A17015	B24010	1
	A18001	A18007	1
	A18001	A18010	2
	A18002	A17002	2
	A18003	A19008	2
	A18004	A19007	2
	A18005	A19006	2
	A18006	A19005	2
	A18007	A24003	2
	A18007	A18001	1
	A18009	A17009	1
	A18010	A18001	2
	A18010	A17001	1
	A18015	A17007	1
	A19001	A16012	2
	A19001	B24006	1
	A19002	A20010	1
	A19002	A17005	2
	A19003	A20011	1
	A19003	A17004	2
	A19004	A20012	1
	A19004	A17003	2
	A19005	A20013	1
	A19005	A18006	2
	A19006	A20014	1
	A19006	A18005	2
	A19007	A20015	1
	A19007	A18004	2
	A19008	A20016	1
	A19008	A18003	2
	A19009	A05005	1
	A19009	C01005	2
	A19010	A10005	1
	A19010	B26005	2
	A19011	A10010	1
	A19011	C05014	2
	A19012	A11005	1
	A19012	F25012	2
	A19013	A11010	1
	A19013	B18011	2
	A19014	A15010	1
	A19014	F25014	2
	A19015	A15005	1
	A19015	D22002	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			4	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	A20001	A20002	1
	A20002	A20001	1
	A20002	A20003	2
	A20003	A20002	2
	A20003	A20004	1
	A20004	A20003	1
	A20004	A20005	2
	A20005	A20004	2
	A20005	A20006	1
	A20006	A20005	1
	A20006	A20007	2
	A20007	A20006	2
	A20007	A20008	1
	A20008	A20007	1
	A20009	A17006	1
	A20010	A19002	1
	A20011	A19003	1
	A20012	A19004	1
	A20013	A19005	1
	A20014	A19006	1
	A20015	A19007	1
	A20016	A19008	1
	A21001	A21002	1
	A21002	A21001	1
	A21002	B25015	2
	A21003	A21004	1
	A21004	A21003	1
	A21004	B25007	2
	A21005	A21011	1
	A21007	A16005	1
	A21009	A21010	1
	A21009	A16006	2
	A21010	A21009	1
	A21011	A21005	1
	A21011	A21014	2
	A21012	B21005	1
	A21012	B14010	2
	A21013	B25006	1
	A21014	A21011	2
	A21014	A21016	1
	A21015	B25014	1
	A21016	A21014	1
	A22001	A22008	1
	A22002	E25002	1
	A22002	B15006	2
	A22003	A27004	1
	A22003	A24010	2
	A22004	B24003	1
	A22008	A22001	1
	A22014	A23013	1
	A22015	A23004	2
	A23001	A23002	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	A23002	A23001	1
	A23002	A24015	2
	A23003	A23004	1
	A23004	A23003	1
	A23004	A22015	2
	A23005	A23006	1
	A23006	A23005	1
	A23006	A24007	2
	A23007	C20003	1
	A23009	A23010	1
	A23010	A23009	1
	A23010	A16004	2
	A23011	B21007	1
	A23011	A24006	2
	A23012	A23014	1
	A23013	A22014	1
	A23014	A23012	1
	A23014	A23016	2
	A23015	A24014	2
	A23016	A23014	2
	A24001	A24008	2
	A24002	A24011	2
	A24002	A24003	1
	A24003	A24002	1
	A24003	A18007	2
	A24004	B20006	1
	A24005	D03009	1
	A24006	A23011	2
	A24007	A23006	2
	A24008	A24009	1
	A24008	A24001	2
	A24009	A24008	1
	A24010	A22003	2
	A24010	A24011	1
	A24011	A24010	1
	A24011	A24002	2
	A24012	D14004	1
	A24013	D20005	1
	A24014	B21003	1
	A24014	A23015	2
	A24015	A23002	2
	A25002	C30002	2
	A25003	D18005	1
	A25003	A14007	2
	A25004	D28002	1
	A25005	B27013	2
	A25005	C26012	2
	A25006	A25010	1
	A25007	C29004	1
	A25009	C29012	1
	A25010	F15004	2
	A25010	A25006	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			5	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
A25011	C28002	1
A25011	E28013	2
A25012	E14014	1
A25013	F21009	2
A25014	F30005	1
A25015	A25016	1
A25016	A25015	1
A26001	B30001	1
A26002	C25013	1
A26002	A26003	2
A26003	A26002	2
A26003	JF31013	1
A26004	A30015	1
A26004	B29006	2
A26005	A30001	1
A26005	B29005	2
A26006	A29015	1
A26006	B29004	2
A26007	A29001	1
A26007	B29003	2
A26009	B30009	2
A26010	B18012	1
A26010	B30010	2
A26012	B30002	1
A26013	B29012	1
A26014	B29011	1
A26015	B29010	1
A27001	B30007	1
A27003	E29013	2
A27003	A28003	1
A27004	B25003	2
A27004	A22003	1
A27005	A27008	1
A27006	B13012	1
A27007	B27012	1
A27008	A27005	1
A27009	JE31043	1
A27010	B14004	1
A27011	B20004	1
A27012	C14007	1
A27013	E29014	2
A27013	A28013	1
A27015	B30006	1
A28001	B30005	1
A28003	A27003	1
A28003	A29003	2
A28004	A28008	1
A28005	B20012	1
A28006	B14012	1
A28007	JE31041	1
A28008	A28004	1
A28008	A28010	2

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
A28009	JE31036	1
A28010	A28008	2
A28011	B11004	1
A28012	B12011	1
A28013	A27013	1
A28013	A29013	2
A28015	B30004	1
A29001	A26007	1
A29003	A28003	2
A29003	A30003	1
A29004	B13005	1
A29005	B11012	1
A29006	A29008	1
A29007	JE31010	1
A29008	A29006	1
A29008	A29010	2
A29009	JE31007	1
A29010	A29008	2
A29011	B12004	1
A29012	B13011	2
A29013	A28013	2
A29013	A30013	1
A29015	A26006	1
A30001	A26005	1
A30003	A29003	1
A30004	B14005	2
A30005	B12012	1
A30006	A30008	1
A30007	JE31003	1
A30008	A30006	1
A30008	A30010	2
A30009	JE31026	1
A30010	A30008	2
A30011	B13004	1
A30012	B14011	1
A30013	A29013	1
A30015	A26004	1
B01002	B01003	2
B01002	JF31022	1
B01003	B14015	1
B01003	B01002	2
B01004	B01005	1
B01004	B02011	2
B01005	B01011	2
B01005	B01004	1
B01006	B01007	2
B01006	JF31020	1
B01007	B14001	1
B01007	B01006	2
B01009	JB31013	1
B01010	JB31036	1
B01011	B06011	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			6	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
B01011	B01005	2
B01012	B06012	1
B01012	B02012	2
B01013	JB31035	1
B01014	JB31012	1
B01015	B01016	1
B01016	B01015	1
B02002	B02003	2
B02002	JF31023	1
B02003	B13015	1
B02003	B02002	2
B02004	B02005	2
B02004	B03011	1
B02005	B02011	1
B02005	B02004	2
B02006	B02007	2
B02006	JF31019	1
B02007	B13001	1
B02007	B02006	2
B02009	JB31015	1
B02010	JB31038	1
B02011	B01004	2
B02011	B02005	1
B02012	B01012	2
B02012	B03012	1
B02013	JB31037	1
B02014	JB31014	1
B02015	B02016	1
B02016	B02015	1
B03002	B03003	2
B03002	JF31012	1
B03003	B12015	1
B03003	B03002	2
B03004	B03005	1
B03004	B04011	2
B03005	B03011	2
B03005	B03004	1
B03006	B03007	2
B03006	JF31011	1
B03007	B12001	1
B03007	B03006	2
B03009	JB31018	1
B03010	JB31041	1
B03011	B02004	1
B03011	B03005	2
B03012	B02012	1
B03012	B04012	2
B03013	JB31040	1
B03014	JB31017	1
B03015	B03016	1
B03016	B03015	1
B04002	B04003	2
B04002	JF31017	1
B04003	B11015	1
B04003	B04002	2
B04004	B04005	2
B04004	B05011	1
B04005	B04011	1
B04005	B04004	2
B04006	B04007	2
B04006	JF31015	1
B04007	B11001	1
B04007	B04006	2
B04009	JB31020	1
B04010	JB31043	1
B04011	B03004	2
B04011	B04005	1
B04012	B03012	2
B04012	B05012	1
B04013	JB31042	1
B04014	JB31019	1
B04015	B04016	1
B04016	B04015	1
B05002	B05003	2
B05002	JF31014	1
B05003	B20015	1
B05003	B05002	2
B05004	B05005	1
B05005	B05011	2
B05005	B05004	1
B05006	B05007	2
B05006	JF31005	1
B05007	B20001	1
B05007	B05006	2
B05009	JB31022	1
B05010	JB31045	1
B05011	B04004	1
B05011	B05005	2
B05012	B04012	1
B05012	JC31043	2
B05013	JB31044	1
B05014	JB31021	1
B05015	B05016	1
B05016	B05015	1
B06002	C02005	1
B06002	B06003	2
B06003	B06002	2
B06003	F02002	1
B06004	B07011	2
B06004	B06005	1
B06005	B06004	1
B06005	B06011	2
B06006	B06007	2
B06006	JF31002	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			7	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	B06007	B18004	1
	B06007	B06006	2
	B06009	JA31003	1
	B06010	JA31026	1
	B06011	B06005	2
	B06011	B01011	1
	B06012	B07012	2
	B06012	B01012	1
	B06013	JA31024	1
	B06014	JA31001	1
	B06015	B06016	1
	B06016	B06015	1
	B07002	E14010	1
	B07002	B07003	2
	B07003	B07002	2
	B07004	B08011	1
	B07004	B07005	2
	B07005	B07004	2
	B07005	B07011	1
	B07006	JC31022	1
	B07006	B07007	2
	B07007	B07006	2
	B07007	F12011	1
	B07009	JB31001	1
	B07010	JB31024	1
	B07011	B07005	1
	B07011	B06004	2
	B07012	B08012	1
	B07012	B06012	2
	B07013	JB31034	1
	B07014	JB31011	1
	B07015	B07016	1
	B07016	B07015	1
	B08002	JC31023	1
	B08002	B08003	2
	B08003	B08002	2
	B08003	B14007	1
	B08004	B09011	2
	B08004	B08005	1
	B08005	B08004	1
	B08005	B08011	2
	B08006	JC31040	1
	B08006	B08007	2
	B08007	B08006	2
	B08007	B13009	1
	B08009	JB31003	1
	B08010	JB31026	1
	B08011	B08005	2
	B08011	B07004	1
	B08012	B09012	2
	B08012	B07012	1
	B08013	JB31025	1
	B08014	JB31002	1
	B08015	B08016	1
	B08016	B08015	1
	B09002	JC31041	1
	B09002	B09003	2
	B09003	B09002	2
	B09003	B13007	1
	B09004	B10011	1
	B09004	B09005	2
	B09005	B09004	2
	B09005	B09011	1
	B09006	B09007	2
	B09006	F03012	1
	B09007	C20004	1
	B09007	B09006	2
	B09009	JA31004	1
	B09010	JA31027	1
	B09011	B09005	1
	B09011	B08004	2
	B09012	B10012	1
	B09012	B08012	2
	B09013	JB31027	1
	B09014	JB31004	1
	B09015	B09016	1
	B09016	B09015	1
	B10004	B10005	1
	B10004	B10011	2
	B10005	B15004	2
	B10005	B10004	1
	B10006	B10007	1
	B10007	C15010	2
	B10007	B10006	1
	B10009	JB31009	1
	B10010	JB31032	1
	B10011	B10004	2
	B10011	B09004	1
	B10012	B15012	2
	B10012	B09012	1
	B10013	JA31029	1
	B10014	JA31006	1
	B10015	B10016	1
	B10016	B10015	1
	B11001	B04007	1
	B11002	F03004	1
	B11003	B12003	2
	B11004	D09004	2
	B11004	A28011	1
	B11005	B11007	1
	B11006	C14009	1
	B11007	B11005	1
	B11007	B11008	2
	B11008	B11007	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			8	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
B11008	B11009	1
B11009	B11008	1
B11009	B11011	2
B11010	D03004	1
B11010	B21014	2
B11011	B11009	2
B11012	D09012	2
B11012	A29005	1
B11013	B12013	2
B11013	C06004	1
B11014	F03002	1
B11015	B04003	1
B12001	B03007	1
B12002	F04014	1
B12003	B13003	1
B12003	B11003	2
B12004	D08004	2
B12004	A29011	1
B12005	B12007	1
B12006	B27007	1
B12007	B12005	1
B12007	B12008	2
B12008	B12007	2
B12008	B12009	1
B12009	B12008	1
B12010	B16014	1
B12011	D08011	2
B12011	A28012	1
B12012	D08012	2
B12012	A30005	1
B12013	B13013	1
B12013	B11013	2
B12014	F04012	1
B12015	B03003	1
B13001	B02007	1
B13002	F04010	1
B13003	B14003	2
B13003	B12003	1
B13004	D07004	2
B13004	A30011	1
B13005	D07005	2
B13005	A29004	1
B13006	F24012	1
B13007	B09003	1
B13009	B08007	1
B13010	F23004	1
B13011	D07011	1
B13011	A29012	2
B13012	D07012	2
B13012	A27006	1
B13013	B14013	2
B13013	B12013	1
B13014	F04006	1
B13015	B02003	1
B14001	B01007	1
B14002	F04004	1
B14003	B19003	1
B14003	B13003	2
B14004	D06004	2
B14004	A27010	1
B14005	D06005	1
B14005	A30004	2
B14006	C18010	2
B14006	B25010	1
B14007	B08003	1
B14009	F12009	1
B14010	A21012	2
B14010	JF31025	1
B14011	D15014	2
B14011	A30012	1
B14012	D06012	2
B14012	A28006	1
B14013	B19013	1
B14013	B13013	2
B14014	F04002	1
B14015	B01003	1
B15002	C10010	1
B15002	B15003	2
B15003	B15002	2
B15003	JF31029	1
B15004	B15005	1
B15004	B10005	2
B15005	B15011	2
B15005	B15004	1
B15006	A22002	2
B15006	B15007	1
B15007	B15006	1
B15007	JF31010	2
B15009	JA31036	1
B15010	JA31014	1
B15011	C15014	1
B15011	B15005	2
B15012	A11014	1
B15012	B10012	2
B15013	JA31035	1
B15014	JA31012	1
B15015	B15016	1
B15016	B15015	1
B16002	C02010	1
B16002	C14003	2
B16003	E16003	1
B16003	F28003	2
B16004	C03002	2
B16005	C16002	1

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)	WL		9	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
B16006	F19006	2	
B16006	F17010	1	
B16007	E20010	1	
B16009	E30004	1	
B16010	E26014	1	
B16011	E26013	1	
B16012	E20014	2	
B16013	B17010	1	
B16014	E20002	2	
B16014	B12010	1	
B16015	B16016	1	
B16016	B16015	1	
B17002	C13013	2	
B17002	C20010	1	
B17003	C19014	2	
B17003	F20012	1	
B17005	C12004	1	
B17006	C12007	1	
B17007	B18002	1	
B17009	B18006	1	
B17010	B16013	1	
B17011	D25013	1	
B17013	C14014	1	
B17013	JD31020	2	
B17014	C18011	1	
B17014	JD31021	2	
B17015	B17016	1	
B17016	B17015	1	
B18002	B17007	1	
B18002	D25002	2	
B18003	E16002	2	
B18004	B06007	1	
B18005	A16007	1	
B18005	C20002	2	
B18006	B17009	1	
B18006	C20003	2	
B18007	F30013	1	
B18009	C07004	1	
B18010	C20007	1	
B18011	A19013	2	
B18011	F01003	1	
B18012	A26010	1	
B18013	JF31009	2	
B18014	B26012	1	
B18015	B18016	1	
B18016	B18015	1	
B19003	B20003	2	
B19003	B14003	1	
B19013	B20013	2	
B19013	B14013	1	
B20001	B05007	1	
B20002	F03010	1	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
B20003	F30012	1	
B20003	B19003	2	
B20004	D10004	2	
B20004	A27011	1	
B20005	B20007	1	
B20006	A24004	1	
B20007	B20005	1	
B20007	B20008	2	
B20008	B20007	2	
B20008	B20009	1	
B20009	B20008	1	
B20009	B20011	2	
B20010	C14012	1	
B20011	B20009	2	
B20012	D10012	2	
B20012	A28005	1	
B20013	F30007	1	
B20013	B19013	2	
B20014	F03006	1	
B20015	B05003	1	
B21002	JC31020	1	
B21002	C05003	2	
B21003	A24014	1	
B21004	JC31012	1	
B21005	C18012	2	
B21005	A21012	1	
B21006	JD31022	1	
B21007	A23011	1	
B21009	D04013	1	
B21010	JD31044	1	
B21011	JD31043	1	
B21012	D13012	1	
B21013	C11001	2	
B21014	B11010	2	
B21015	B21016	1	
B21016	B21015	1	
B22002	D15005	2	
B22003	B23009	1	
B22004	B23007	1	
B22004	A17009	2	
B22005	B24009	1	
B22006	B23003	1	
B22010	C27004	1	
B22011	C23011	1	
B22011	B23014	2	
B22012	F10012	1	
B22013	C22003	2	
B22013	D25004	1	
B22014	C04004	1	
B22014	C28014	2	
B22015	B22016	1	
B22016	B22015	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			10	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	B23002	B28007	1
	B23002	B25011	2
	B23003	D15006	2
	B23003	B22006	1
	B23004	B24011	2
	B23004	JF3101A	1
	B23005	C01011	2
	B23005	B24005	1
	B23007	B22004	1
	B23008	B23013	1
	B23009	B22003	1
	B23011	B24012	1
	B23012	B24006	2
	B23013	B2300A	1
	B23014	B22011	2
	B23014	B28009	1
	B23015	B23016	1
	B23016	B23015	1
	B24002	F09013	2
	B24003	A22004	1
	B24004	C30005	1
	B24005	B23005	1
	B24006	A19001	1
	B24006	B23012	2
	B24007	A16014	1
	B24009	B22005	1
	B24010	A17015	1
	B24010	B24013	2
	B24011	A16011	1
	B24011	B23004	2
	B24012	B23011	1
	B24013	B24010	2
	B24014	C01005	1
	B24014	F01002	2
	B24015	B24016	1
	B24016	B24015	1
	B25001	B25008	1
	B25002	D20009	1
	B25003	B25011	1
	B25003	A27004	2
	B25004	E17002	1
	B25006	A21013	1
	B25007	A21004	2
	B25008	B25001	1
	B25009	A14010	2
	B25009	F24002	1
	B25010	B14006	1
	B25010	E28002	2
	B25011	B23002	2
	B25011	B25003	1
	B25012	C30012	1
	B25014	A21015	1
	B25015	A21002	2
	B26002	JC31024	1
	B26002	C25006	2
	B26003	C25011	1
	B26003	F13002	2
	B26004	C27003	1
	B26005	A19010	2
	B26005	JF31007	1
	B26006	C06011	1
	B26006	F15010	2
	B26007	C27014	1
	B26009	B27011	1
	B26010	B29014	1
	B26011	C28010	1
	B26012	B18014	1
	B26013	D29012	1
	B26014	F20003	1
	B26015	B26016	1
	B26016	B26015	1
	B27002	B27010	1
	B27002	E29006	2
	B27003	C27010	1
	B27004	F10010	1
	B27005	C27009	1
	B27006	C27007	1
	B27007	B12006	1
	B27009	D18006	1
	B27010	C30013	2
	B27010	B27002	1
	B27011	B26009	1
	B27012	A27007	1
	B27013	E28009	1
	B27013	A25005	2
	B27014	D17011	1
	B27015	B27016	1
	B27016	B27015	1
	B28001	B2800A	1
	B28002	B29007	1
	B28003	B30007	2
	B28004	B30006	2
	B28005	B30005	2
	B28006	B30004	2
	B28007	B28009	2
	B28007	B23002	1
	B28008	B28001	1
	B28009	B23014	1
	B28009	B28007	2
	B28010	B30015	1
	B28010	D07009	2
	B28011	B30014	1
	B28011	D07007	2
	B28012	B30013	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			11	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
B28012	D08009	2
B28013	B30012	1
B28013	C10013	2
B28015	B29009	1
B29001	B29008	1
B29003	A26007	2
B29004	A26006	2
B29005	A26005	2
B29006	A26004	2
B29007	B28002	1
B29008	B29001	1
B29009	B28015	1
B29010	A26015	1
B29011	A26014	1
B29012	A26013	1
B29012	D06009	2
B29013	B30003	1
B29013	D06007	2
B29014	B26010	1
B30001	F27001	2
B30001	A26001	1
B30002	A26012	1
B30002	B30003	2
B30003	B30002	2
B30003	B29013	1
B30004	A28015	1
B30004	B28006	2
B30005	A28001	1
B30005	B28005	2
B30006	A27015	1
B30006	B28004	2
B30007	A27001	1
B30007	B28003	2
B30009	F15007	1
B30009	A26009	2
B30010	A26010	2
B30010	C28004	1
B30012	B28013	1
B30013	B28012	1
B30014	B28011	1
B30015	B28010	1
C01002	C15015	1
C01002	A11009	2
C01003	D05001	2
C01003	C01006	1
C01004	D18004	1
C01005	A19009	2
C01005	B24014	1
C01006	C01003	1
C01007	C01011	1
C01009	C01014	1
C01010	D05004	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
C01011	C01007	1
C01011	B23005	2
C01012	C09004	1
C01013	D19002	2
C01013	C04003	1
C01014	C01009	1
C01014	C02003	2
C01015	C01016	1
C01016	C01015	1
C02002	C09010	1
C02003	C01014	2
C02003	C04002	1
C02004	D16011	1
C02004	C10002	2
C02005	JF31003	2
C02005	B06002	1
C02006	JC31003	1
C02006	C20013	2
C02007	C08005	1
C02009	F15002	1
C02010	D13014	2
C02010	B16002	1
C02011	C08007	1
C02012	C14006	1
C02013	JE31023	1
C02013	C03010	2
C02014	JD31015	1
C02015	C02016	1
C02016	C02015	1
C03002	E20007	1
C03002	B16004	2
C03003	C19003	1
C03004	C19002	1
C03005	F14003	1
C03005	C04010	2
C03006	JC31002	1
C03007	C04014	1
C03009	E07002	1
C03010	C02013	2
C03011	E16011	1
C03012	C06002	1
C03013	C08004	1
C03013	C19005	2
C03014	F15006	1
C03014	C24014	2
C03015	C03016	1
C03016	C03015	1
C04002	C02003	1
C04002	C13014	2
C04003	C01013	1
C04004	B22014	1
C04005	C06013	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			12	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C04006	C09013	2	
C04007	C06006	1	
C04009	E12014	1	
C04010	C03005	2	
C04011	C09006	1	
C04011	D12010	2	
C04012	E12004	1	
C04013	C09003	2	
C04013	C19014	1	
C04014	C03007	1	
C04014	F05005	2	
C04015	C04016	1	
C04016	C04015	1	
C05002	JC31021	1	
C05003	B21002	2	
C05004	F19012	1	
C05005	D13002	1	
C05006	E02001	1	
C05007	E03004	1	
C05008	C31046	2	
C05009	D25005	1	
C05010	D14006	2	
C05011	C24003	2	
C05012	C18004	1	
C05013	A14007	1	
C05014	A19011	2	
C05015	C05016	1	
C05016	C05015	1	
C06002	C03012	1	
C06002	C17003	2	
C06003	C16014	1	
C06004	B11013	1	
C06005	C11003	1	
C06006	C04007	1	
C06007	F05013	1	
C06009	C08012	1	
C06010	C13007	1	
C06011	B26006	1	
C06012	JD31045	1	
C06012	C08002	2	
C06013	C04005	1	
C06014	D25006	1	
C06015	C06016	1	
C06016	C06015	1	
C07002	C07005	1	
C07002	C09014	2	
C07003	JD31033	1	
C07003	F09005	2	
C07004	B18009	1	
C07004	C07012	2	
C07005	C07011	2	
C07005	C07002	1	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C07006	F24014	1	
C07007	F23003	1	
C07010	F09011	1	
C07011	C15013	1	
C07011	C07005	2	
C07012	C07004	2	
C07012	F14004	1	
C07013	F24011	2	
C07013	D12011	1	
C07014	D20010	2	
C07015	C07016	1	
C07016	C07015	1	
C08002	C06012	2	
C08002	D20003	1	
C08003	C08008	1	
C08004	C10006	2	
C08004	C03013	1	
C08005	C02007	1	
C08006	C13010	2	
C08006	C13011	1	
C08007	C02011	1	
C08008	C08003	1	
C08010	C09012	1	
C08011	D03012	1	
C08012	C06009	1	
C08013	C14004	1	
C08014	F15009	1	
C08015	C08016	1	
C08016	C08015	1	
C09002	F05007	1	
C09003	C09007	1	
C09003	C04013	2	
C09004	C01012	1	
C09004	D14012	2	
C09005	C22011	1	
C09005	E26003	2	
C09006	C04011	1	
C09007	C09003	1	
C09009	C12005	1	
C09009	C10003	1	
C09010	C02002	1	
C09011	C16007	1	
C09012	C08010	1	
C09012	E19003	2	
C09013	D17007	1	
C09013	C04006	2	
C09014	C07002	2	
C09014	C10011	1	
C09015	C09016	1	
C09016	C09015	1	
C10002	C02004	2	
C10002	C10005	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			13	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	C10002	C21005	2
	C10003	C11012	2
	C10003	C09009	1
	C10003	C12005	2
	C10004	D16009	1
	C10005	C10011	2
	C10005	C10011	2
	C10005	C10002	1
	C10006	C08004	2
	C10007	C13006	1
	C10009	F02004	1
	C10010	B15002	1
	C10011	C09014	1
	C10011	C10005	2
	C10011	C10005	2
	C10012	C23012	1
	C10012	E26002	2
	C10013	B28013	2
	C10013	D08007	1
	C10014	C19009	1
	C10015	C10016	1
	C10016	C10015	1
	C11001	C11004	1
	C11001	B21013	2
	C11002	C11006	2
	C11003	C06005	1
	C11004	E06014	2
	C11004	C11001	1
	C11005	F19007	1
	C11005	C18014	2
	C11006	C11008	1
	C11006	C11002	2
	C11007	C11016	1
	C11008	C11006	1
	C11008	C11013	2
	C11009	D12014	2
	C11009	C11010	1
	C11010	C11009	1
	C11011	C11012	1
	C11012	C11011	1
	C11012	C13010	2
	C11012	C10003	2
	C11013	C11008	2
	C11014	C11015	1
	C11015	C11014	1
	C11015	D20011	2
	C11016	C11007	1
	C12002	C12006	2
	C12003	C19005	1
	C12003	C21003	2
	C12004	B17005	1
	C12005	C09009	1
	C12005	C10003	2
	C12006	E14006	1
	C12006	C12002	2
	C12007	B17006	1
	C12015	C12016	1
	C12016	C12015	1
	C13002	C18014	1
	C13002	F05014	2
	C13003	C14005	2
	C13003	D18010	1
	C13005	E16014	2
	C13006	C10007	1
	C13006	E13013	2
	C13007	C06010	1
	C13009	D16010	1
	C13010	C11012	2
	C13010	C08006	2
	C13011	C08006	1
	C13011	C14002	2
	C13013	C13014	1
	C13013	B17002	2
	C13014	C04002	2
	C13014	C13013	1
	C13015	C13016	1
	C13016	C13015	1
	C14002	C13011	2
	C14003	B16002	2
	C14003	E13014	1
	C14004	C08013	1
	C14005	JC31009	1
	C14005	C13003	2
	C14006	C02012	1
	C14007	A27012	1
	C14009	B11006	1
	C14010	C18009	1
	C14010	C14014	2
	C14011	JD31014	1
	C14012	B20010	1
	C14013	JD31011	1
	C14014	C14010	2
	C14014	B17013	1
	C14015	C14016	1
	C14016	C14015	1
	C15001	E14011	2
	C15006	F21011	1
	C15007	A17006	2
	C15010	C22005	1
	C15010	B10007	2
	C15011	E11005	1
	C15012	C30003	1
	C15013	C07011	1
	C15013	C21005	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			14	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C15014	B15011		1
C15015	C01002		1
C15015	C20005		2
C16002	F30009		2
C16002	B16005		1
C16003	D13010		2
C16003	C16004		1
C16004	C16003		1
C16005	D16007		1
C16006	C19012		1
C16007	C09011		1
C16009	C23004		1
C16010	F13007		1
C16011	E29010		2
C16014	C06003		1
C16014	C19011		2
C16015	C16016		1
C16016	C16015		1
C17002	C21007		1
C17002	E12011		2
C17003	C06002		2
C17004	D17010		1
C17005	C21009		1
C17006	C17011		2
C17007	C18010		1
C17009	C30013		1
C17010	C22007		1
C17011	E15012		1
C17011	C17006		2
C17012	E03005		1
C17013	F24007		1
C17014	E20009		1
C17015	C17016		1
C17016	C17015		1
C18002	E30009		1
C18003	JE31034		1
C18004	C05012		1
C18004	D19004		2
C18005	JE31024		1
C18006	E30013		1
C18007	JE31029		1
C18009	C14010		1
C18010	C17007		1
C18010	B14006		2
C18011	B17014		1
C18012	B21005		2
C18012	D15004		1
C18013	JE31001		1
C18014	C11005		2
C18014	C13002		1
C18015	C18016		1
C18016	C18015		1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
C19002	C03004		1
C19003	F20010		2
C19003	C03003		1
C19004	D15011		1
C19005	C03013		2
C19005	C12003		1
C19006	C26009		1
C19007	D23014		1
C19009	C10014		1
C19010	C24002		2
C19011	C16014		2
C19011	C23005		1
C19012	C16006		1
C19013	D24009		1
C19014	C04013		1
C19014	B17003		2
C19015	C19016		1
C19016	C19015		1
C20002	B18005		2
C20003	B18006		2
C20003	A23007		1
C20004	B09007		1
C20005	C15015		2
C20005	F01015		1
C20006	A12005		1
C20007	B18010		1
C20009	C20014		1
C20010	B17002		1
C20010	D28005		2
C20011	D14010		1
C20012	F20011		1
C20013	C02006		2
C20013	D17006		1
C20014	C20009		1
C20015	C20016		1
C20016	C20015		1
C21002	C22014		2
C21003	C12003		2
C21003	D14013		1
C21004	C21012		2
C21004	C22004		1
C21005	C10002		2
C21005	C15013		2
C21005	C21011		1
C21006	C21013		1
C21007	C17002		1
C21009	C17005		1
C21010	C22003		1
C21011	C21005		1
C21011	C23011		2
C21012	D24007		1
C21012	C21004		2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			15	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
C21013	C21006	1	
C21013	C26004	2	
C21014	D23012	1	
C21014	C22002	2	
C21015	C21016	1	
C21016	C21015	1	
C22002	C21014	2	
C22003	C21010	1	
C22003	B22013	2	
C22004	C21004	1	
C22005	C15010	1	
C22005	C22011	2	
C22006	C22013	1	
C22006	C24011	2	
C22007	C17010	1	
C22010	C24002	1	
C22011	C22005	2	
C22011	C09005	1	
C22012	D24012	1	
C22013	C22006	1	
C22013	D24011	2	
C22014	D23009	1	
C22014	C21002	2	
C22015	C22016	1	
C22016	C22015	1	
C23002	C25009	1	
C23002	C23014	2	
C23003	C23013	2	
C23003	E26007	1	
C23004	C16009	1	
C23004	D29012	2	
C23005	C19011	1	
C23005	F18011	2	
C23006	F19004	1	
C23007	F15005	1	
C23009	F20005	1	
C23011	C21011	2	
C23011	B22011	1	
C23012	C28004	2	
C23012	C10012	1	
C23013	D29010	1	
C23013	C23003	2	
C23014	C23002	2	
C23014	D29014	1	
C23015	C23016	1	
C23016	C23015	1	
C24002	C22010	1	
C24002	C19010	2	
C24003	D18009	1	
C24003	C05011	2	
C24004	E16007	1	
C24004	D15010	2	
C24005	F23007	1	
C24006	E16005	1	
C24007	E05011	1	
C24009	C25010	1	
C24010	E15013	2	
C24011	C22006	2	
C24014	C03014	2	
C24015	C24016	1	
C24016	C24015	1	
C25004	D24004	1	
C25005	D24005	1	
C25006	B26002	2	
C25006	E12003	1	
C25007	C26003	1	
C25009	C23002	1	
C25010	C24009	1	
C25011	B26003	1	
C25012	JC31037	1	
C25013	A26002	1	
C25014	A14005	1	
C25015	C25016	1	
C25016	C25015	1	
C26002	F13009	1	
C26003	C25007	1	
C26003	F13003	2	
C26004	C21013	2	
C26005	C27011	1	
C26005	C26014	2	
C26007	D15003	1	
C26008	C26013	1	
C26009	C19006	1	
C26010	E11002	1	
C26011	D23002	2	
C26012	F08007	1	
C26012	A25005	2	
C26013	C26008	1	
C26014	C26005	2	
C26014	D29002	1	
C26015	C26016	1	
C26016	C26015	1	
C27002	D21013	1	
C27003	B26004	1	
C27004	B22010	1	
C27005	C28013	1	
C27005	C27011	2	
C27007	B27006	1	
C27009	B27005	1	
C27010	B27003	1	
C27011	C27005	2	
C27011	C26005	1	
C27012	E15009	1	
C27013	F13004	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			16	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
C27014	B26007	1	
C27015	C27016	1	
C27016	C27015	1	
C28002	E15010	2	
C28002	A25011	1	
C28003	F25003	1	
C28004	B30010	1	
C28004	C23012	2	
C28005	C30011	2	
C28005	C28012	1	
C28007	C28011	1	
C28010	B26011	1	
C28011	C28007	1	
C28012	C28005	1	
C28012	C28013	2	
C28013	C28012	2	
C28013	C27005	1	
C28014	B22014	2	
C28014	E24009	1	
C28015	C28016	1	
C28016	C28015	1	
C29002	C30009	1	
C29003	C29013	2	
C29004	A25007	1	
C29005	D28007	1	
C29005	C30014	2	
C29006	D27003	1	
C29007	D27013	1	
C29009	D27014	1	
C29010	D27006	1	
C29011	D28009	1	
C29011	F05010	2	
C29012	A25009	1	
C29013	D18013	1	
C29013	C29003	2	
C29014	F10009	1	
C29015	C29016	1	
C29016	C29015	1	
C30002	F29014	1	
C30002	A25002	2	
C30003	C15012	1	
C30003	C30004	2	
C30004	C30003	2	
C30004	C30011	1	
C30005	B24004	1	
C30006	D26002	1	
C30007	D19014	1	
C30009	C29002	1	
C30011	C30004	1	
C30011	C28005	2	
C30012	B25012	1	
C30013	C17009	1	
C30013	B27010	2	
C30014	C29005	2	
C30015	C30016	1	
C30016	C30015	1	
C31026	C31027	1	
C31027	C31026	1	
C31027	C31028	2	
C31028	C31027	2	
C31028	C31030	1	
C31030	C31028	1	
C31030	C31038	2	
C31038	C31030	2	
C31038	C31046	1	
C31046	C31038	1	
C31046	C05008	2	
D01002	D06015	1	
D01003	JE31025	1	
D01004	D06001	1	
D01005	JE31002	1	
D01006	D07015	1	
D01007	JE31006	1	
D01009	JE31009	1	
D01010	D07001	1	
D01011	JE31013	1	
D01012	D08015	1	
D01013	JE31040	1	
D01014	D08001	1	
D01015	D01016	1	
D01016	D01015	1	
D02002	D09015	1	
D02003	JE31042	1	
D02004	D09001	1	
D02005	JE31022	1	
D02006	D10015	1	
D02007	JD31025	1	
D02008	D31030	1	
D02009	JD31003	1	
D02010	D10001	1	
D02011	JD31004	1	
D02012	D11015	1	
D02014	D11001	1	
D02015	D02016	1	
D02016	D02015	1	
D03001	D03008	1	
D03002	D03003	2	
D03002	E02006	1	
D03003	D03010	1	
D03003	D03002	2	
D03004	B11010	1	
D03005	F08012	1	
D03006	D04015	1	
D03007	D04002	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			17	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
D03008	D03001	1	
D03009	A24005	1	
D03010	D05003	2	
D03010	D03003	1	
D03011	D14002	1	
D03012	C08011	1	
D03013	D12013	1	
D03013	D13013	2	
D03014	D04013	2	
D03015	D04004	2	
D04001	D04002	1	
D04002	D04001	1	
D04002	D03007	2	
D04003	D04004	1	
D04004	D04003	1	
D04004	D03015	2	
D04005	D04006	1	
D04005	D05007	2	
D04006	D04005	1	
D04007	D0400A	1	
D0400A	D04007	1	
D0400A	D05015	2	
D04009	D05014	1	
D04010	D04012	1	
D04011	D05006	1	
D04012	D04010	1	
D04012	D04014	2	
D04013	B21009	1	
D04013	D03014	2	
D04014	D04012	2	
D04014	D04016	1	
D04015	D03006	1	
D04016	D04014	1	
D05001	F25009	1	
D05001	C01003	2	
D05002	E21012	1	
D05003	D05011	1	
D05003	D03010	2	
D05004	C01010	1	
D05006	D04011	1	
D05007	D04005	2	
D05008	D05009	1	
D05009	D0500A	1	
D05010	E11013	2	
D05010	D25014	1	
D05011	D14005	2	
D05011	D05003	1	
D05012	E11012	1	
D05014	D04009	1	
D05015	D0400A	2	
D06001	D01004	1	
D06003	D11003	2	

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
D06003	D07003	1	
D06004	E08013	1	
D06004	B14004	2	
D06005	E13003	2	
D06005	B14005	1	
D06006	D21010	2	
D06007	B29013	2	
D06009	B29012	2	
D06010	E23014	1	
D06011	E07007	2	
D06011	D15014	1	
D06012	E08012	1	
D06012	B14012	2	
D06013	D11013	2	
D06013	D07013	1	
D06015	D01002	1	
D07001	D01010	1	
D07003	D06003	1	
D07003	D08003	2	
D07004	E08015	1	
D07004	B13004	2	
D07005	E06009	1	
D07005	B13005	2	
D07006	E23011	1	
D07007	B28011	2	
D07007	F20002	1	
D07009	B28010	2	
D07010	D21006	2	
D07011	E13005	2	
D07011	B13011	1	
D07012	E08014	1	
D07012	B13012	2	
D07013	D06013	1	
D07013	D08013	2	
D07015	D01006	1	
D08001	D01014	1	
D08003	D07003	2	
D08003	D09003	1	
D08004	E09013	1	
D08004	B12004	2	
D08005	D0800B	1	
D08006	F20004	2	
D08007	C10013	1	
D08007	E30002	2	
D0800B	D08005	1	
D08009	B28012	2	
D08009	F10006	1	
D08010	D21004	2	
D08011	E13002	1	
D08011	B12011	2	
D08012	E09012	1	
D08012	B12012	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			18	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
D08013	D07013	2
D08013	D09013	1
D08015	D01012	1
D09001	D02004	1
D09003	D08003	1
D09003	D10003	2
D09004	E09015	1
D09004	B11004	2
D09005	F29010	1
D09006	E22011	1
D09007	F27014	1
D09009	F27015	1
D09010	D25010	2
D09011	F29007	2
D09012	E09014	1
D09012	B11012	2
D09013	D08013	1
D09013	D10013	2
D09015	D02002	1
D10001	D02010	1
D10003	D09003	2
D10004	E10013	1
D10004	B20004	2
D10005	F29013	1
D10006	D25012	2
D10007	D10008	1
D10008	D10007	1
D10008	D10009	2
D10009	D10008	2
D10010	D25011	2
D10011	F29003	1
D10012	E10012	1
D10012	B20012	2
D10013	D09013	2
D10015	D02006	1
D11001	D02014	1
D11003	D12004	1
D11003	D06003	2
D11008	D11009	1
D11009	D11008	1
D11009	D11010	2
D11010	D11009	2
D11010	D11011	1
D11011	D11010	1
D11011	D11012	2
D11012	D11011	2
D11013	D12007	1
D11013	D06013	2
D11015	D02012	1
D12002	JD31017	1
D12003	D12005	2
D12004	D11003	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
D12005	D16004	1
D12005	D12003	2
D12006	JD31037	1
D12007	D11013	1
D12009	F05003	1
D12010	C04011	2
D12011	C07013	1
D12012	E05014	1
D12013	D03013	1
D12013	D20004	2
D12014	F28009	1
D12014	C11009	2
D12015	D12016	1
D12016	D12015	1
D13002	E16006	2
D13002	C05006	1
D13003	D20004	1
D13003	E19011	2
D13004	D13005	1
D13005	D13004	1
D13006	F30003	1
D13007	E10011	1
D13009	D14014	1
D13010	D19009	1
D13010	C16003	2
D13011	D20006	1
D13011	F29014	2
D13012	B21012	1
D13013	D03013	2
D13014	D14007	1
D13014	C02010	2
D13015	D13016	1
D13016	D13015	1
D14002	D14003	2
D14002	D03011	1
D14003	D18003	1
D14003	D14002	2
D14004	A24012	1
D14005	D14011	1
D14005	D05011	2
D14006	C05010	2
D14007	D13014	1
D14010	C20011	1
D14011	D29011	2
D14011	D14005	1
D14012	C09004	2
D14012	F08005	1
D14013	C21003	1
D14013	E15014	2
D14014	D13009	1
D14014	D20002	2
D14015	D14016	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			19	B

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	D14016	D14015	1
	D15002	D17009	1
	D15003	C26007	1
	D15004	C18012	1
	D15005	D17013	1
	D15005	B22002	2
	D15006	B23003	2
	D15007	D19013	1
	D15009	E07014	2
	D15009	D15012	1
	D15010	C24004	2
	D15011	C19004	1
	D15011	D16006	2
	D15012	D15009	1
	D15013	D17002	2
	D15014	D06011	1
	D15014	B14011	2
	D15015	D15016	1
	D15016	D15015	1
	D16002	F23010	1
	D16003	F25007	1
	D16004	D12005	1
	D16005	D17003	1
	D16006	D15011	2
	D16007	C16005	1
	D16009	C10004	1
	D16010	C13009	1
	D16011	C02004	1
	D16011	E14004	2
	D16012	E18002	1
	D16013	E24013	1
	D16014	E18001	2
	D16015	D16016	1
	D16016	D16015	1
	D17002	E13009	1
	D17002	D15013	2
	D17003	D16005	1
	D17006	C20013	1
	D17007	C09013	1
	D17009	D15002	1
	D17010	C17004	1
	D17011	B27014	1
	D17012	JE31045	1
	D17013	D15005	1
	D17014	F09012	1
	D17015	D17016	1
	D17016	D17015	1
	D18002	D20013	1
	D18003	D14003	1
	D18004	C01004	1
	D18005	A25003	1
	D18006	B27009	1
	D18007	D18014	1
	D18009	C24003	1
	D18010	C13003	1
	D18011	E15006	1
	D18012	JC31014	1
	D18012	E02005	2
	D18013	C29013	1
	D18014	D18007	1
	D18015	D18016	1
	D18016	D18015	1
	D19002	D27009	1
	D19002	C01013	2
	D19003	A12010	1
	D19003	E30010	2
	D19004	C18004	2
	D19004	F08013	1
	D19009	D13010	1
PE54018			
	D19010	A13005	1
	D19010	D19011	2
	D19011	D19010	2
	D19011	E30014	1
	D19012	D19013	2
	D19012	JE31020	1
	D19013	D15007	1
	D19013	D19012	2
	D19014	C30007	1
	D19015	D19016	1
	D19016	D19015	1
	D20002	D14014	2
	D20002	E12012	1
	D20003	C08002	1
	D20003	D20006	2
	D20004	D12013	2
	D20004	D13003	1
	D20005	A24013	1
	D20006	D20003	2
	D20006	D13011	1
	D20007	E20002	1
	D20009	B25002	1
	D20010	E20003	1
	D20010	C07014	2
	D20011	C11015	2
	D20012	E18002	2
	D20013	D18002	1
PE54018	D20013	F22009	2
	D20014	JD31023	1
	D20015	D20016	1
	D20016	D20015	1
	D21002	E21013	1
	D21002	D24003	2
	D21004	E22014	1
	D21004	D08010	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			20	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
D21005	D24002	1	
D21006	E23012	1	
D21006	D07010	2	
D21007	D23002	1	
D21009	D23006	1	
D21010	E23013	1	
D21010	D06006	2	
D21011	D24006	1	
D21012	E24011	1	
D21013	C27002	1	
D21014	E19004	2	
D21014	D24014	1	
D21015	D21016	1	
D21016	D21015	1	
D22002	A19015	2	
D22002	D22003	1	
D22003	D22002	1	
D22003	F01004	2	
D22004	D22005	1	
D22005	D22004	1	
D22006	F25005	1	
D22007	D22014	1	
D22009	D22013	1	
D22010	D29006	1	
D22011	JC31036	1	
D22011	F25004	2	
D22012	E25002	2	
D22013	D22009	1	
D22014	D22007	1	
D22015	D22016	1	
D22016	D22015	1	
D23002	D21007	1	
D23002	C26011	2	
D23003	D23005	2	
D23004	D23010	1	
D23005	D25009	1	
D23005	D23003	2	
D23006	D21009	1	
D23007	D23013	1	
D23009	C22014	1	
D23010	D23004	1	
D23011	D23014	2	
D23012	C21014	1	
D23013	D23007	1	
D23013	F13011	2	
D23014	C19007	1	
D23014	D23011	2	
D23015	D23016	1	
D23016	D23015	1	
D24002	D21005	1	
D24003	D21002	2	
D24003	D25012	1	
D24004	C25004	1	
D24005	C25005	1	
D24005	D24013	2	
D24006	D21011	1	
D24007	C21012	1	
D24009	C19013	1	
D24010	D25007	1	
D24011	C22013	2	
D24012	C22012	1	
D24013	D24005	2	
D24014	D21014	1	
D24015	D24016	1	
D24016	D24015	1	
D25002	B18002	2	
D25002	F30006	1	
D25003	E13012	1	
D25004	B22013	1	
D25005	C05009	1	
D25005	D25006	2	
D25006	D25005	2	
D25006	C06014	1	
D25007	D24010	1	
D25009	D23005	1	
D25010	E22012	1	
D25010	D09010	2	
D25011	E21014	1	
D25011	D10010	2	
D25012	D24003	1	
D25012	D10006	2	
D25013	B17011	1	
D25014	D05010	1	
D25015	D25016	1	
D25016	D25015	1	
D26002	C30006	1	
D26003	JD31024	1	
D26004	D27013	2	
D26005	JD31006	1	
D26006	D27014	2	
D26007	JD31029	1	
D26009	JE31035	1	
D26010	F25011	1	
D26011	JE31015	1	
D26012	F25013	1	
D26013	JE31019	1	
D26014	F19003	1	
D26015	D26016	1	
D26016	D26015	1	
D27002	JD31035	1	
D27002	D28006	2	
D27003	C29006	1	
D27004	D27011	1	
D27005	JD31013	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			21	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	D27005	D28010	2
	D27006	C29010	1
	D27007	D27010	1
	D27009	D19002	1
	D27010	D27007	1
	D27011	D27004	1
	D27012	F29009	1
	D27013	C29007	1
	D27013	D26004	2
	D27014	C29009	1
	D27014	D26006	2
	D27015	D27016	1
	D27016	D27015	1
	D28002	A25004	1
	D28002	D28003	2
	D28003	D28002	2
	D28003	D28004	1
	D28004	D28003	1
	D28004	D28014	2
	D28005	C20010	2
	D28005	D28011	1
	D28006	D27002	2
	D28007	C29005	1
	D28009	C29011	1
	D28010	D27005	2
	D28010	F19014	1
	D28011	D28005	1
	D28011	E11004	2
	D28014	D28004	2
	D28015	D28016	1
	D28016	D28015	1
	D29002	C26014	1
	D29002	D29005	2
	D29003	D29007	1
	D29004	D30009	1
	D29005	D29002	2
	D29005	D29011	1
	D29006	D22010	1
	D29007	D29003	1
	D29009	E29011	1
	D29010	C23013	1
	D29011	D29005	1
	D29011	D14011	2
	D29012	C23004	2
	D29012	B26013	1
	D29013	D29014	2
	D29013	F20006	1
	D29014	C23014	1
	D29014	D29013	2
	D29015	D29016	1
	D29016	D29015	1
	D30009	D29004	1
	D30015	D30016	1
	D30016	D30015	1
	D31030	D31038	2
	D31030	D02008	1
	D31038	D31046	1
	D31038	D31030	2
	D31046	D31038	1
	E01001	F23009	1
	E01001	E02001	2
	E01003	E01004	1
	E01003	F17011	2
	E01004	E02006	2
	E01004	E01003	1
	E01005	E02003	1
	E01006	E15007	1
	E01007	E25005	2
	E01009	E09007	2
	E01010	E08003	2
	E01011	E08004	2
	E01012	E08009	2
	E01013	E08007	2
	E01014	F28010	1
	E02001	E01001	2
	E02001	C05006	1
	E02003	E02007	2
	E02003	E01005	1
	E02004	E02008	1
	E02005	D18012	2
	E02006	D03002	1
	E02006	E01004	2
	E02007	E15003	1
	E02007	E02003	2
	E02008	E02004	1
	E02009	E10009	2
	E02010	E10007	2
	E02011	E09003	2
	E02012	E09004	2
	E02013	E09009	2
	E02014	F28011	1
	E03001	JE31004	1
	E03001	E08005	2
	E03002	E08009	1
	E03003	E08007	1
	E03004	C05007	1
	E03005	C17012	1
	E03006	E08004	1
	E03007	E08003	1
	E03009	JE31011	1
	E03009	E08002	2
	E03010	JE31032	1
	E03010	E08001	2
	E03011	E04011	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			22	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	E03012	E04005	1
	E03013	E04004	1
	E03014	E04014	1
	E03015	JE31027	1
	E03015	E08006	2
	E04001	JE31017	1
	E04001	E09005	2
	E04002	E09009	1
	E04003	E09007	1
	E04004	E03013	1
	E04005	E03012	1
	E04006	E09004	1
	E04007	E09003	1
	E04008	E31046	1
	E04009	JD31001	1
	E04009	E09002	2
	E04010	JE31021	1
	E04010	E09001	2
	E04011	E05011	2
	E04011	E03011	1
	E04012	E05005	1
	E04013	E05004	1
	E04014	E05014	2
	E04014	E03014	1
	E04015	JE31014	1
	E04015	E09006	2
	E05001	JD31010	1
	E05001	E10005	2
	E05002	E10009	1
	E05003	E10007	1
	E05004	E04013	1
	E05005	E04012	1
	E05008	E05009	1
	E05009	E05008	1
	E05009	E05010	2
	E05010	E05009	2
	E05011	C24007	1
	E05011	E04011	2
	E05013	F23006	1
	E05014	D12012	1
	E05014	E04014	2
	E05015	JD31027	1
	E05015	E10006	2
	E06002	E07002	2
	E06004	E06008	1
	E06005	JE31037	1
	E06006	E06007	1
	E06007	E06006	1
	E06007	E13002	2
	E06008	E06004	1
	E06008	E06011	2
	E06009	E07013	2

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	E06009	D07005	1
	E06011	E06008	2
	E06011	E06012	1
	E06012	E06011	1
	E06014	C11004	2
	E06014	E07014	1
	E06015	E06016	1
	E06016	E06015	1
	E07002	C03009	1
	E07002	E06002	2
	E07003	E13005	1
	E07004	JE31033	1
	E07005	JE31028	1
	E07006	E07007	1
	E07007	E07006	1
	E07007	D06011	2
	E07009	F20009	1
	E07010	E13003	1
	E07011	JE31005	1
	E07012	JE31012	1
	E07013	E06009	2
	F07014	D15009	2
	E07014	E06014	1
	F07015	E07016	1
	E07016	E07015	1
	E08001	E03010	2
	E08002	E03009	2
	E08003	E03007	1
	E08003	E01010	2
	E08004	E03006	1
	E08004	E01011	2
	E08005	E03001	2
	E08006	E03015	2
	E08007	E03003	1
	E08007	E01013	2
	E08009	E03002	1
	E08009	E01012	2
	F08010	F23012	1
	E08010	E09010	2
	E08011	E09011	1
	E08012	D06012	1
	E08013	D06004	1
	E08014	D07012	1
	E08015	D07004	1
	E09001	E04010	2
	E09002	E04009	2
	E09003	E04007	1
	E09003	E02011	2
	E09004	E04006	1
	E09004	E02012	2
	E09005	E04001	2
	E09006	E04015	2

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			23	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
E09007	E04003	1
E09007	E01009	2
E09009	E04002	1
E09009	E02013	2
E09010	E08010	2
E09010	E10010	1
E09011	E10011	2
E09011	E08011	1
E09012	D08012	1
E09013	D08004	1
E09014	D09012	1
E09015	D09004	1
E10001	E10002	1
E10002	E10001	1
E10002	E10003	2
E10003	E10002	2
E10003	E10004	1
E10004	E10003	1
E10004	E10008	2
E10005	E05001	2
E10006	E05015	2
E10007	E05003	1
E10007	E02010	2
E10008	E10004	2
E10009	E05002	1
E10009	E02009	2
E10010	E09010	1
E10011	D13007	1
E10011	E09011	2
E10012	D10012	1
F10013	D10004	1
E11002	C26010	1
E11003	E12003	2
E11004	D28011	2
E11004	F13013	1
E11005	C15011	1
E11005	E11011	2
E11007	E12005	1
E11009	E29002	1
E11011	E11005	2
E11011	E18003	1
E11012	D05012	1
E11013	E11014	1
E11013	D05010	2
E11014	F09010	2
E11014	E11013	1
E11015	E11016	1
E11016	E11015	1
E12002	JC31025	1
E12003	C25006	1
E12003	E11003	2
E12004	C04012	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	Z LEVEL
E12005	E11007	1
E12005	F10003	2
E12006	JC31001	1
E12007	F05002	1
E12009	F27001	1
E12010	E12011	1
E12011	C17002	2
E12011	E12010	1
E12012	D20002	1
E12012	E24010	2
E12013	F10002	1
E12014	C04009	1
E12015	E12016	1
E12016	E12015	1
E13002	E06007	2
E13002	D08011	1
E13003	E07010	1
E13003	D06005	2
E13004	E13011	1
E13005	E07003	1
E13005	D07011	2
E13006	JC31018	1
E13007	E13010	1
E13009	D17002	1
E13010	E13007	1
E13011	E13004	1
E13012	D25003	1
E13013	C13006	2
E13013	F13010	1
E13014	C14003	1
E13014	F23010	2
E13015	E13016	1
E13016	E13015	1
E14002	E23001	1
E14002	E14005	2
E14003	F05012	1
E14004	D16011	2
E14005	E14002	2
E14006	C12006	1
E14010	B07002	1
E14011	F28004	1
E14011	C15001	2
E14012	F21010	1
E14012	E14013	2
E14013	E14012	2
E14014	A25012	1
E14015	E14016	1
E14016	E14015	1
E15002	JC31017	1
E15003	E15006	2
E15003	E02007	1
E15004	E15005	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			24	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
E15005	E15004	1
E15005	E20012	2
E15006	D18011	1
E15006	E15003	2
E15007	E01006	1
E15009	C27012	1
E15010	F10013	1
E15010	C28002	2
E15011	JD31020	1
E15012	C17011	1
E15013	F05004	1
E15013	C24010	2
E15014	D14013	2
E15014	F05006	1
E15015	E15016	1
E15016	E15015	1
E16002	E17013	1
E16002	B18003	2
E16003	B16003	1
E16004	E17012	1
E16004	E19012	2
E16005	C24006	1
E16006	E17011	1
E16006	D13002	2
E16007	C24004	1
E16009	JF31003	1
E16010	E17010	1
E16010	F14014	2
E16011	C03011	1
E16012	E17009	1
E16013	F15014	1
E16014	E17005	1
E16014	C13005	2
E16015	E16016	1
E16016	E16015	1
E17001	E18012	1
E17002	B25004	1
E17005	E16014	1
E17009	E16012	1
E17010	E16010	1
E17011	E16006	1
E17012	E16004	1
E17013	E16002	1
E17014	E18013	1
E17015	E18014	1
E18001	E19006	1
E18001	D16014	2
E18002	D16012	1
E18002	D20012	2
E18003	E11011	1
E18003	E18004	2
E18004	E18003	2
E18004	E18005	1
E18005	E18004	1
E18005	E18006	2
E18006	E18005	2
E18006	E18007	1
E18007	E18006	1
E18007	E18009	2
E18009	E18007	2
E18009	E18010	1
E18010	E18009	1
E18010	E19014	2
E18012	E17001	1
E18013	E17014	1
E18014	E17015	1
E19002	E19005	2
E19002	E25001	1
E19003	C09012	2
E19004	E24012	1
E19004	D21014	2
E19005	E19014	1
E19005	E19002	2
E19006	E18001	1
E19009	E19013	1
E19010	F23014	1
E19011	D13003	2
E19012	E16004	2
E19012	F24006	1
E19013	E19009	1
E19014	E18010	2
E19014	E19005	1
E19015	E19016	1
E19016	E19015	1
E20002	D20007	1
E20002	B16014	2
E20003	D20010	1
E20006	JC31010	1
E20007	C03002	1
E20009	C17014	1
E20010	B16007	1
E20011	E25006	1
E20012	E15005	2
E20012	E25005	1
E20013	E28004	1
E20014	F18014	1
E20014	B16012	2
E20015	E20016	1
E20016	E20015	1
E21001	E26006	2
E21001	E22001	1
E21002	E22002	2
E21002	F30002	1
E21003	E21004	1

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
E21004	E21003	1
E21004	E21005	2
E21005	E21004	2
E21005	E21006	1
E21006	E21005	1
E21006	E21008	2
E21007	E22007	1
E21008	E21006	2
E21009	E22009	2
E21010	E22015	1
E21012	D05002	1
E21013	D21002	1
E21014	D25011	1
E22001	E21001	1
E22001	E23001	2
E22002	E23002	1
E22002	E21002	2
E22003	E22004	1
E22004	E22003	1
E22004	E22005	2
E22005	E22004	2
E22005	E22006	1
E22006	E22005	1
E22006	E22008	2
E22007	E23007	2
E22007	E21007	1
E22008	E22006	2
E22009	E27001	1
E22009	E21009	2
E22010	E23015	1
E22011	D09006	1
E22012	D25010	1
E22013	F20004	1
E22014	D21004	1
E22015	E21010	1
E23001	E22001	2
E23001	E14002	1
E23002	E24002	2
E23002	E22002	1
E23003	E23004	1
E23004	E23003	1
E23004	E23005	2
E23005	E23004	2
E23005	E23006	1
E23006	E23005	1
E23006	E23008	2
E23007	E24015	1
E23007	E22007	2
E23008	E23006	2
E23009	E24009	2
E23009	E28011	1
E23010	E24001	2
E23010	E28014	1
E23011	D07006	1
E23012	D21006	1
E23013	D21010	1
E23014	D06010	1
E23015	E22010	1
E24001	E24003	1
E24001	E23010	2
E24002	E25015	1
E24002	E23002	2
E24003	E25010	2
E24003	E24001	1
E24004	E24005	1
E24005	E24004	1
E24005	E24006	2
E24006	E24005	2
E24006	E24008	1
E24007	E24010	1
E24007	E29005	2
E24008	E24006	1
E24009	C28014	1
E24009	E23009	2
E24010	E12012	2
E24010	E24007	1
E24011	D21012	1
E24012	E19004	1
E24013	D16013	1
E24014	F10014	1
E24015	E23007	1
E25001	E19002	1
E25001	E25007	2
E25002	D22012	2
E25002	A22002	1
E25003	E25004	1
E25004	E25003	1
E25004	E25008	2
E25005	E20012	1
E25005	E01007	2
E25006	E20011	1
E25007	E25001	2
E25007	E25010	1
E25008	E25004	2
E25009	F30004	1
F25010	E25007	1
E25010	E24003	2
E25015	E24002	1
E26001	F13012	1
E26002	C10012	2
E26002	F27010	1
E26003	C09006	2
E26003	E26004	1
E26004	E26003	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			26	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	Z LEVEL
E26004	E26005	2
E26005	E26004	2
E26005	E26006	1
E26006	E26005	1
E26006	E21001	2
E26007	C23003	1
E26007	F13006	2
E26009	E29009	1
E26010	E27010	2
E26010	F29002	1
E26012	F18010	1
E26013	B16011	1
E26014	B16010	1
E27001	E28011	2
E27001	E22009	1
E27002	F19009	1
E27002	E28012	2
E27003	E28005	1
E27003	E27009	2
E27004	E27005	1
E27005	E27004	1
E27005	E27006	2
E27006	E27005	2
E27006	E27008	1
E27007	E29012	2
F27007	F08003	1
E27008	E27006	1
E27009	E27003	2
E27009	E27010	1
E27010	E27009	1
E27010	E26010	2
E27013	E29013	1
E27014	E29014	1
F28002	B25010	2
E28002	E28003	1
E28003	E28002	1
E28003	JF31024	2
E28004	E20013	1
E28005	E28014	2
F28005	E27003	1
E28006	F18002	1
E28009	B27013	1
E28011	E23009	1
F28011	E27001	2
E28012	E27002	2
E28013	A25011	2
E28014	E23010	1
E28014	E28005	2
E28015	E28016	1
F28016	E28015	1
E29002	E11009	1
E29003	F14009	1
E29004	F18005	1
E29005	E24007	2
E29006	B27002	2
E29007	F24003	1
E29009	E26009	1
E29010	F10007	1
E29010	C16011	2
E29011	D29009	1
E29011	F20003	2
E29012	E27007	2
E29013	E27013	1
E29013	A27003	2
E29014	E27014	1
E29014	A27013	2
F29015	E29016	1
E29016	E29015	1
E30002	D08007	2
E30002	F27003	1
E30003	F10005	1
F30004	B16009	1
E30004	F08004	2
E30005	F15004	1
E30009	C18002	1
E30010	D19003	2
E30013	C18006	1
E30014	D19011	1
E30015	E30016	1
E30016	E30015	1
F31030	E3103B	1
E3103B	E31030	1
F3103B	E31046	2
E31046	E3103B	2
F31046	E04008	1
F01002	B24014	2
F01003	B18011	1
F01004	D22003	2
F01005	JF31007	2
F01006	F03013	1
F01007	F04009	1
F0100B	F04007	1
F01009	F04005	1
F01010	F03007	1
F01011	F03009	1
F01012	F01015	2
F01013	F01014	1
F01013	F0200B	2
F01014	F06007	2
F01014	F01013	1
F01015	C20005	1
F01015	F01012	2
F02002	B06003	1
F02003	F0600B	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			27	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
F02004	C10009	1	
F02005	F06013	1	
F02008	F01013	2	
F02015	F02016	1	
F02016	F02015	1	
F03002	B11014	1	
F03003	F06003	1	
F03004	B11002	1	
F03005	F06002	1	
F03006	B20014	1	
F03007	F01010	1	
F03009	F01011	1	
F03010	B20002	1	
F03011	F06006	1	
F03012	B09006	1	
F03017	JF31001	2	
F03013	F01006	1	
F03014	JF31002	2	
F03015	F03016	1	
F03016	F03015	1	
F04002	B14014	1	
F04003	F06015	1	
F04004	B14002	1	
F04005	F01009	1	
F04006	B13014	1	
F04007	F01008	1	
F04008	F31036	1	
F04009	F01007	1	
F04010	B13002	1	
F04011	F06004	1	
F04012	B12014	1	
F04013	F06005	1	
F04014	B12002	1	
F04015	F04016	1	
F04016	F04015	1	
F05002	E12007	1	
F05003	D12009	1	
F05004	E15013	1	
F05005	C04014	2	
F05006	E15014	1	
F05007	C09002	1	
F05008	F31046	1	
F05009	F09014	1	
F05010	C29011	2	
F05011	F19013	1	
F05012	E14003	1	
F05013	C06007	1	
F05014	C13002	2	
F05015	F05016	1	
F05016	F05015	1	
F06002	F03005	1	
F06003	F03003	1	
F06004	F04011	1	
F06005	F04013	1	
F06006	F03011	1	
F06007	F01014	2	
F06008	F02003	1	
F06013	F02005	1	
F06015	F04003	1	
F08002	F14011	2	
F08002	F08011	1	
F08003	E27007	1	
F08003	F10013	2	
F08004	E30004	2	
F08005	D14012	1	
F08007	C26012	1	
F08010	F09013	1	
F08011	F08002	1	
F08012	D03005	1	
F08013	D19004	1	
F08013	F08014	2	
F08014	F08013	2	
F08015	F08016	1	
F08016	F08015	1	
F09002	F15014	2	
F09003	JC31013	1	
F09003	F18003	2	
F09004	F14002	1	
F09005	C07003	2	
F09006	JD31009	1	
F09007	F24011	1	
F09009	F23002	1	
F09010	F14007	1	
F09010	E11014	2	
F09011	C07010	1	
F09011	F24010	2	
F09012	D17014	1	
F09013	F08010	1	
F09013	B24002	2	
F09014	F05009	1	
F09015	F09016	1	
F09016	F09015	1	
F10002	E12013	1	
F10003	E12005	2	
F10004	F15003	1	
F10005	E30003	1	
F10006	D08009	1	
F10006	F20014	2	
F10007	E29010	1	
F10009	C29014	1	
F10010	B27004	1	
F10011	F20007	1	
F10012	B22012	1	
F10013	F08003	2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			28	B

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
	F10013	E15010	1
	F10014	E24014	1
	F10015	F10016	1
	F10016	F10015	1
	F12009	B14009	1
	F12010	F21005	2
	F12011	B07007	1
	F12015	F12016	1
	F12016	F12015	1
	F13002	B26003	2
	F13003	C26003	2
	F13004	C27013	1
	F13005	F18011	1
	F13006	E26007	2
	F13007	C16010	1
	F13009	C26002	1
	F13010	E13013	1
	F13011	D23013	2
	F13012	E26001	1
	F13013	E11004	1
	F13013	JF31006	2
	F13014	F19005	1
	F13015	F13016	1
	F13016	F13015	1
	F14002	F09004	1
	F14003	F14013	2
	F14003	C03005	1
	F14004	C07012	1
	F14004	F14012	2
	F14005	F14014	1
	F14007	F09010	1
	F14009	E29003	1
	F14011	F27009	1
	F14011	F08002	2
	F14012	F14004	2
	F14012	F18006	1
	F14013	F24009	1
	F14013	F14003	2
	F14014	E16010	2
	F14014	F14005	1
	F14015	F14016	1
	F14016	F14015	1
	F15002	C02009	1
	F15003	F10004	1
	F15003	F15006	2
	F15004	E30005	1
	F15004	A25010	2
	F15005	C23007	1
	F15006	F15003	2
	F15006	C03014	1
	F15007	B30009	1
	F15009	C08014	1
	F15010	B26006	2
	F15010	F15011	1
	F15011	F15010	1
	F15014	E16013	1
	F15014	F09002	2
	F15015	F15016	1
	F15016	F15015	1
	F17010	B16006	1
	F17011	E01003	2
	F17011	F17014	1
	F17012	F30010	1
	F17013	F19006	2
	F17014	F17011	1
PE54015	F17015	F17016	1
	F18002	E28006	1
	F18003	F09003	2
	F18003	F25010	1
	F18004	F18005	2
	F18005	E29004	1
	F18005	F18004	2
	F18006	F14012	1
	F18007	F19006	1
	F18009	F19010	1
	F18010	E26012	1
	F18010	F18014	2
	F18011	C23005	2
	F18011	F13005	1
	F18014	F18010	2
	F18014	E20014	1
	F18015	F18016	1
	F18016	F18015	1
	F19002	A13010	1
	F19003	D26014	1
	F19004	C23006	1
	F19005	F13014	1
	F19006	F18007	1
	F19006	F17013	2
	F19006	B16006	2
	F19007	C11005	1
	F19009	E27002	1
	F19010	F18009	1
	F19011	F21009	1
	F19012	C05004	1
	F19013	F05011	1
	F19014	D28010	1
	F19015	F19016	1
	F19016	F19015	1
	F20002	D07007	1
	F20003	E29011	2
	F20003	B26014	1
	F20004	E22013	1
	F20004	D08006	2
	F20005	C23009	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			29	B

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
	F20006	D29013	1
	F20007	F10011	1
	F20009	E07009	1
	F20010	JE31044	1
	F20010	C19003	2
	F20011	C20012	1
	F20012	B17003	1
	F20013	F25002	1
	F20014	F10006	2
	F20015	F20016	1
	F20016	F20015	1
	F21005	F28002	1
	F21005	F12010	2
	F21006	F22015	1
	F21007	F22002	2
	F21009	F19011	1
	F21009	A25013	2
	F21010	F21011	2
	F21010	E14012	1
	F21011	C15006	1
	F21011	F21010	2
	F21012	F30014	1
	F22001	F22002	1
	F22002	F22001	1
	F22002	F21007	2
PE54018	F22009	D20013	2
	F22015	F21006	1
	F23002	F09009	1
	F23002	F24013	2
	F23003	C07007	1
	F23004	B13010	1
	F23005	JC31007	1
	F23005	F23011	2
	F23006	E05013	1
	F23007	C24005	1
	F23009	E01001	1
	F23010	E13014	2
	F23010	D16002	1
	F23011	F23005	2
	F23012	E08010	1
	F23013	JC31032	1
	F23014	E19010	1
	F23015	F23016	1
	F23016	F23015	1
	F24002	B25009	1
	F24003	E29007	1
	F24004	JF31009	1
	F24005	JC31029	1
	F24006	E19012	1
	F24007	C17013	1
	F24009	F14013	1
	F24010	F09011	2
	F24011	F09007	1
	F24011	C07013	2
	F24012	B13006	1
	F24013	F23002	2
	F24014	C07006	1
	F24015	F24016	1
	F24016	F24015	1
	F25002	F20013	1
	F25003	C28003	1
	F25004	D22011	2
	F25005	D22006	1
	F25006	JD31040	1
	F25007	D16003	1
	F25009	D05001	1
	F25010	F18003	1
	F25011	D26010	1
	F25012	A19012	2
	F25013	D26012	1
	F25014	A19014	2
	F25015	F25016	1
	F25016	F25015	1
	F27001	E12009	1
	F27001	B30001	2
	F27002	F27003	2
	F27003	E30002	1
	F27003	F27002	2
	F27009	F29002	2
	F27009	F14011	1
	F27010	E26002	1
	F27014	D09007	1
	F27015	D09009	1
	F28002	F21005	1
	F28003	B16003	2
	F28004	F14011	1
	F28009	D12014	1
	F28010	E01014	1
	F28011	E02014	1
	F28015	F28016	1
	F28016	F28015	1
	F29002	E26010	1
	F29002	F27009	2
	F29003	D10011	1
	F29004	F29005	1
	F29005	F29004	1
	F29005	F29008	2
	F29006	F29007	1
	F29007	F29006	1
	F29007	D09011	2
	F29008	F29005	2
	F29008	F29011	1
	F29009	D27012	1
	F29010	D09005	1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			30	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTI-NATION	# LEVEL
F29011	F29008	1	
F29011	F29012	2	
F29012	F29011	2	
F29013	D10005	1	
F29014	D13011	2	
F29014	C30002	1	
F29015	F29016	1	
F29016	F29015	1	
F30002	E21002	1	
F30002	F30003	2	
F30003	F30002	2	
F30003	D13006	1	
F30004	E25009	1	
F30005	F30014	2	
F30005	A25014	1	
F30006	D25002	1	
F30007	B20013	1	
F30009	C16002	2	
F30010	F30011	2	
F30010	F30011	2	
F30010	F17012	1	
F30011	JF31010	1	
F30011	F30010	2	
F30011	F30010	2	
F30012	B20003	1	
F30013	B18007	1	
F30014	F21012	1	
F30014	F30005	2	
F30015	F30016	1	
F30016	F30015	1	
F31026	F31027	1	
F31027	F31026	1	
F31027	F31028	2	
F31028	F31027	2	
F31029	F31030	1	
F31030	F31028	1	
F31030	F31032	2	
F31032	F31030	2	
F31032	F31033	1	
F31033	F31032	1	
F31033	F31034	2	
F31034	F31033	2	
F31034	F31035	1	
F31035	F31034	1	
F31035	F31036	2	
F31036	F31035	2	
F31036	F04008	1	
F31037	F31038	1	
F31038	F31037	1	
F31038	F31040	2	
F31040	F31038	2	
F31040	F31041	1	
F31041	F31040	1	
F31041	F31042	2	
F31042	F31041	2	
F31042	F31043	1	
F31043	F31042	1	
F31043	F31044	2	
F31044	F31043	2	
F31044	F31045	1	
F31045	F31044	1	
F31045	F31046	2	
F31046	F31045	2	
F31046	F05008	1	
JA31001	B06014	1	
JA31002	A03001	1	
JA31003	B06009	1	
JA31004	B09009	1	
JA31005	A02004	1	
JA31006	B10014	1	
JA31007	A08002	1	
JA31009	JC31035	1	
JA31009	JA31032	2	
JA31010	A04003	1	
JA31011	A03007	1	
JA31012	B15014	1	
JA31013	JA31037	1	
JA31014	B15010	1	
JA31015	A01001	1	
JA31017	JA31037	2	
JA31017	JA31041	1	
JA31018	A02006	1	
JA31019	A02007	1	
JA31020	JA31041	2	
JA31020	A05008	1	
JA31021	A03006	1	
JA31022	A01004	1	
JA31023	A08004	1	
JA31024	B06013	1	
JA31025	A03002	1	
JA31026	B06010	1	
JA31027	B09010	1	
JA31028	A02003	1	
JA31029	B10013	1	
JA31032	JA31009	2	
JA31033	A04004	1	
JA31034	A03008	1	
JA31035	B15013	1	
JA31036	B15009	1	
JA31037	JA31017	2	
JA31037	JA31013	1	
JA31038	A01002	1	
JA31040	A02005	1	
JA31041	JA31017	1	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			31	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	# LEVEL
JA31041	JA31020		2
JA31042	A02008		1
JA31043	A03005		1
JA31044	A01003		1
JA31045	A08003		1
JA31046	A08005		1
JB31001	B07009		1
JB31002	B08014		1
JB31003	B08009		1
JB31004	B09014		1
JB31005	A04002		1
JB31006	A02001		1
JB31007	A03003		1
JB31009	B10009		1
JB31010	A04007		1
JB31011	B07014		1
JB31012	B01014		1
JB31013	B01009		1
JB31014	B02014		1
JB31015	B02009		1
JB31017	B03014		1
JB31018	B03009		1
JB31019	B04014		1
JB31020	B04009		1
JB31021	B05014		1
JB31022	B05009		1
JB31023	A04006		1
JB31024	B07010		1
JB31025	B08013		1
JB31026	B08010		1
JB31027	B09013		1
JB31028	A04001		1
JB31029	A02002		1
JB31030	A03004		1
JB31032	B10010		1
JB31033	A04008		1
JB31034	B07013		1
JB31035	B01013		1
JB31036	B01010		1
JB31037	B02013		1
JB31038	B02010		1
JB31040	B03013		1
JB31041	B03010		1
JB31042	B04013		1
JB31043	B04010		1
JB31044	B05013		1
JB31045	B05010		1
JB31046	A04005		1
JC31001	E12006		1
JC31002	C03006		1
JC31003	C02006		1
JC31007	F23005		1
JC31009	C14005		1
JC31010	E20006		1
JC31012	B21004		1
JC31013	F09003		1
JC31014	D18012		1
JC31017	E15002		1
JC31018	E13006		1
JC31020	B21002		1
JC31021	C05002		1
JC31022	B07006		1
JC31023	B08002		1
JC31024	B26002		1
JC31025	E12002		1
JC31029	F24005		1
JC31032	F23013		1
JC31035	JA31009		1
JC31036	D22011		1
JC31037	C25012		1
JC31040	B08006		1
JC31041	B09002		1
JC31042	JC31043		1
JC31043	B05012		2
JC31043	JC31042		1
JD31001	E04009		1
JD31003	D02009		1
JD31004	D02011		1
JD31006	D26005		1
JD31009	F09006		1
JD31010	E05001		1
JD31011	C14013		1
JD31013	D27005		1
JD31014	C14011		1
JD31015	C02014		1
JD31017	D12002		1
JD31020	B17013		2
JD31020	E15011		1
JD31021	B17014		2
JD31022	B21006		1
JD31023	D20014		1
JD31024	D26003		1
JD31025	D02007		1
JD31027	E05015		1
JD31029	D26007		1
JD31033	C07003		1
JD31035	D27002		1
JD31037	D12006		1
JD31040	F25006		1
JD31043	B21011		1
JD31044	B21010		1
JD31045	C06012		1
JE31001	C18013		1
JE31002	D01005		1

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC BOARD WIRE WRAP (TB304A)			32	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	Z LEVEL
JE31003	A30007		1
JE31004	E03001		1
JE31005	E07011		1
JE31006	D01007		1
JE31007	A29009		1
JE31009	D01009		1
JE31010	A29007		1
JE31011	E03009		1
JE31012	E07012		1
JE31013	D01011		1
JE31014	E04015		1
JE31015	D26011		1
JE31017	E04001		1
JE31019	D26013		1
JE31020	D19012		1
JE31021	E04010		1
JE31022	D02005		1
JE31023	C02013		1
JE31024	C18005		1
JE31025	D01003		1
JE31026	A30009		1
JE31027	E03015		1
JE31028	E07005		1
JE31029	C18007		1
JE31032	E03010		1
JE31033	E07004		1
JE31034	C18003		1
JE31035	D26009		1
JE31036	A28009		1
JE31037	E06005		1
JE31040	D01013		1
JE31041	A28007		1
JE31042	D02003		1
JE31043	A27009		1
JE31044	F20010		1
JE31045	D17012		1
JF31001	F03012		2
JF31002	B06006		1
JF31002	F03014		2
JF31003	E16009		1
JF31003	C02005		2
JF31005	B05006		1
JF31006	F13013		2
JF31007	B26005		1
JF31007	F01005		2
JF31009	F24004		1
JF31009	B18013		2
JF31010	B15007		2
JF31010	F30011		1
JF31011	B03006		1
JF31012	B03002		1
JF31013	A26003		1
JF31014	B05002		1
JF31015	B04006		1
JF31017	B04002		1
JF31018	B23004		1
JF31019	B02006		1
JF31020	B01006		1
JF31022	B01002		1
JF31023	B02002		1
JF31024	E28003		2
JF31025	B14010		1
JF31029	B15003		1

SECTION 7

PARTS DATA

INTRODUCTION

This section provides the information needed to order field replaceable parts for the TB304 Field Test Unit.

Information within this section is provided by representative illustrations and their companion parts lists. The parts shown on the illustrations are assigned index numbers. These numbers cross reference the illustrations to the associated parts lists.

The parts list associated with each illustration is organized in four columns:

- The Index Number column cross references the applicable entry to the associated illustration.
- The Part Number column provides the eight-digit number by which a part may be ordered.
- The Description column provides the part nomenclature. This column also provides information on the relationship of parts and assemblies. This is accomplished by means of indentation within the column. An indented item is part of a previous assembly which is indented to a lesser degree.
- The Notes column is used to show differences in configuration when more than one configuration of a machine is covered in the manual. This is shown by identifying a model level (Mod B), by identifying a machine series code and change order number (S/C 10 with PE39289), or by identifying the last two digits of the eight-digit assembly part number to which the particular part applies (Tab 17).

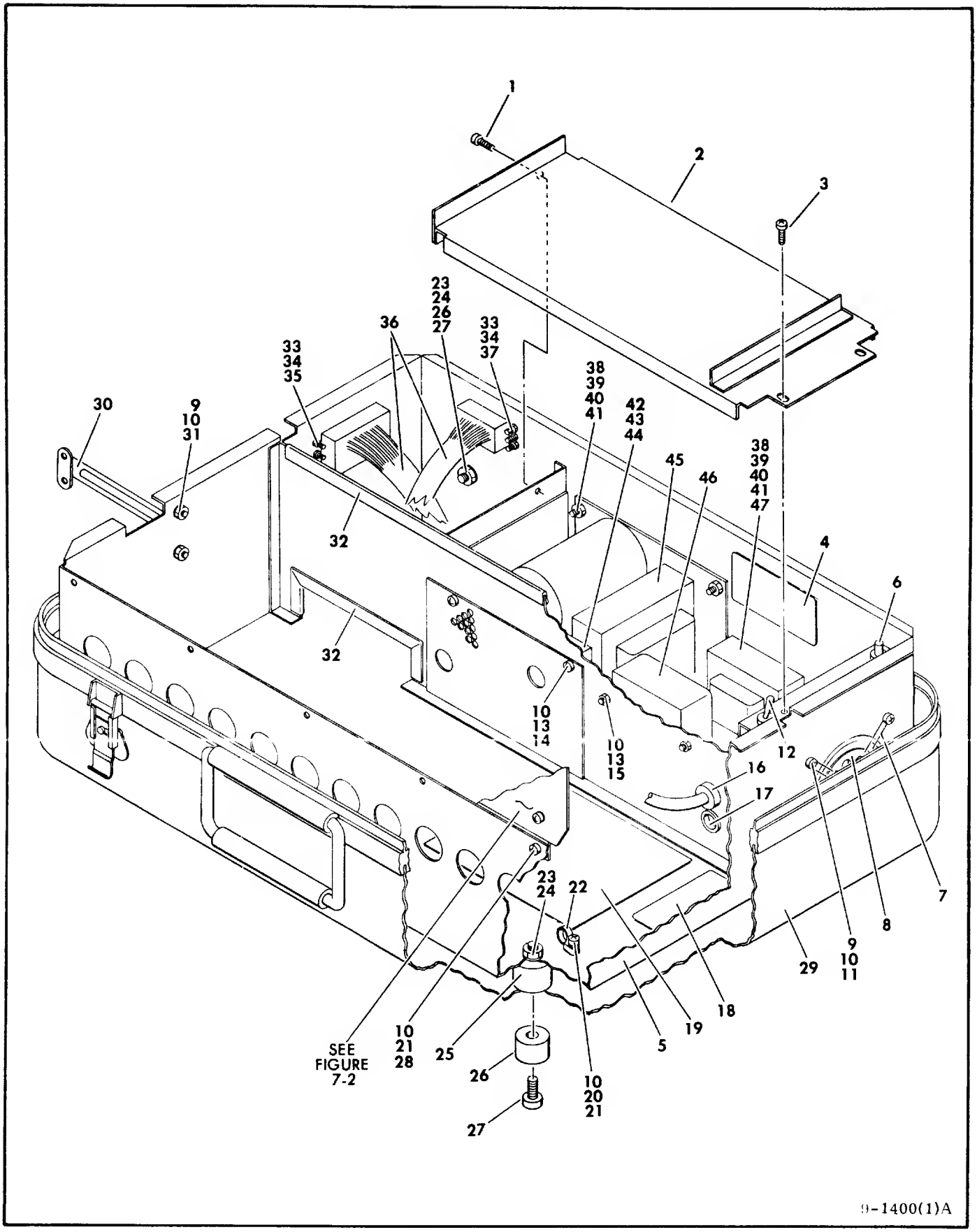


FIGURE 7-1. FINAL ASSEMBLY, STANDARD PACKAGE

INDEX NO.	PART NUMBER	PART DESCRIPTION	NOTES
1-	77449300	FIELD TEST UNIT	TB304-A
1	17901509	SCREW, THREAD ROLLING, PHILLIPS, 6-32 x 3/8	
2	77451400	COVER, POWER SUPPLY	
3	17901508	SCREW, THREAD ROLLING, PHILLIPS, 6-32 x 1/4	
4	46068603	PLATE, WARNING	
5	77451500	HOUSING, FTU	
6	94308204	CIRCUIT BREAKER	
7	94348701	GUARD, FAN, MINIATURE	
8	94348700	FAN, MINIATURE	
9	10125803	WASHER, SPRING LOCK, 6-TOOTH	
10	10125105	NUT, HEX, 6-32	
11	92742179	SCREW, PAN HD, PHILLIPS, 6-32 x 1-7/8	
12	92509009	SWITCH, TOGGLE, 2-POSITION	
13	10126401	WASHER, LOCK, EXT 6-TOOTH	
14	10127115	SCREW, PAN HD, 6-32 x 5/8	
15	10127113	SCREW, PAN HD, 6-32 x 3/8	
16	92491013	RELIEF, CORD	
17	15012410	BUSHING, SNAP-IN	
18	10126600	PLATE, EQUIP. IDENT.	
19	72959300	LABEL, FIELD CHANGE LOG	
20	10127114	SCREW, PAN HD, 6-32 x 1/2	
21	10126103	WASHER, LOCK, INT 6-TOOTH	
22	94277421	STRAP, CABLE TIE	
23	10125301	NUT, HEX, 1/4-20	
24	10126404	WASHER, LOCK, EXT TOOTH, 1/4	
25	92674005	MOUNT, VIBRATION	
26	94202502	BUMPER, RUBBER	
27	10127154	SCREW, PAN HD, 1/4-20 x 5/8	
28	10127111	SCREW, PAN HD, 6-32 x 1/4	
29	94369500	CASE, FIBERGLASS	
30	94370400	SUPPORT, LID, FRICTION	PE54023
31	10125714	SCREW, FH, PHILLIPS, 6-32 x 1/4	
32	94060001	CHANNEL, RUBBER, TYPE 1	
33	93643004	CONNECTOR CORNER GUIDE PIN	
34	93643005	CONNECTOR CORNER GUIDE SOCKET	
35	93642006	CONNECTOR, JACK SCREW, FEMALE	
36	77453600	I/O CABLE ASSY	
37	93642007	CONNECTOR, JACK SCREW, MALE	
38	10125106	NUT, HEX, 8-32	
39	10127123	SCREW, PAN HD, 8-32 x 1/2	
40	10125606	WASHER, PLAIN, 8-TOOTH	
41	10126402	WASHER, LOCK, EXT 8-TOOTH	
42	93041010	STRIP, TERMINAL, BARRIER TYPE	
43	93105110	STRIP, MARKER, TYPE A-10 TERM.	
44	93047002	JUMPER, BARRIER STRIP	
45	94370600	POWER SUPPLY; +5V, 6A	
46	94348402	FILTER, R.F.	
47	94368600	POWER SUPPLY; -5V, 3A	
		ASSEMBLIES NOT SHOWN	
	54226509	TYPE HFSV HD ALIGNMENT CARD ASSY	TB304 A/B ONLY
	77440300	HEAD ALIGNMENT CABLE ASSY	TB304 A/B ONLY
	83249600	A-CABLE ASSY (I/O)	
	77453400	B-CABLE ASSY (I/O)	
	83248700	I/O BYPASS (BEHIND THE I/O) CABLE ASSY	
	83248900	ADAPTER CABLE ASSY, A-CABLE, 50-PIN	
	83249800	ADAPTER CABLE ASSY, A-CABLE, 60-PIN	
	83254300	ADAPTER CABLE ASSY, B-CABLE	
	92183001	TEST LEAD, BLACK	TB304 A/B ONLY
	92183003	TEST LEAD, RED	TB304 A/B ONLY

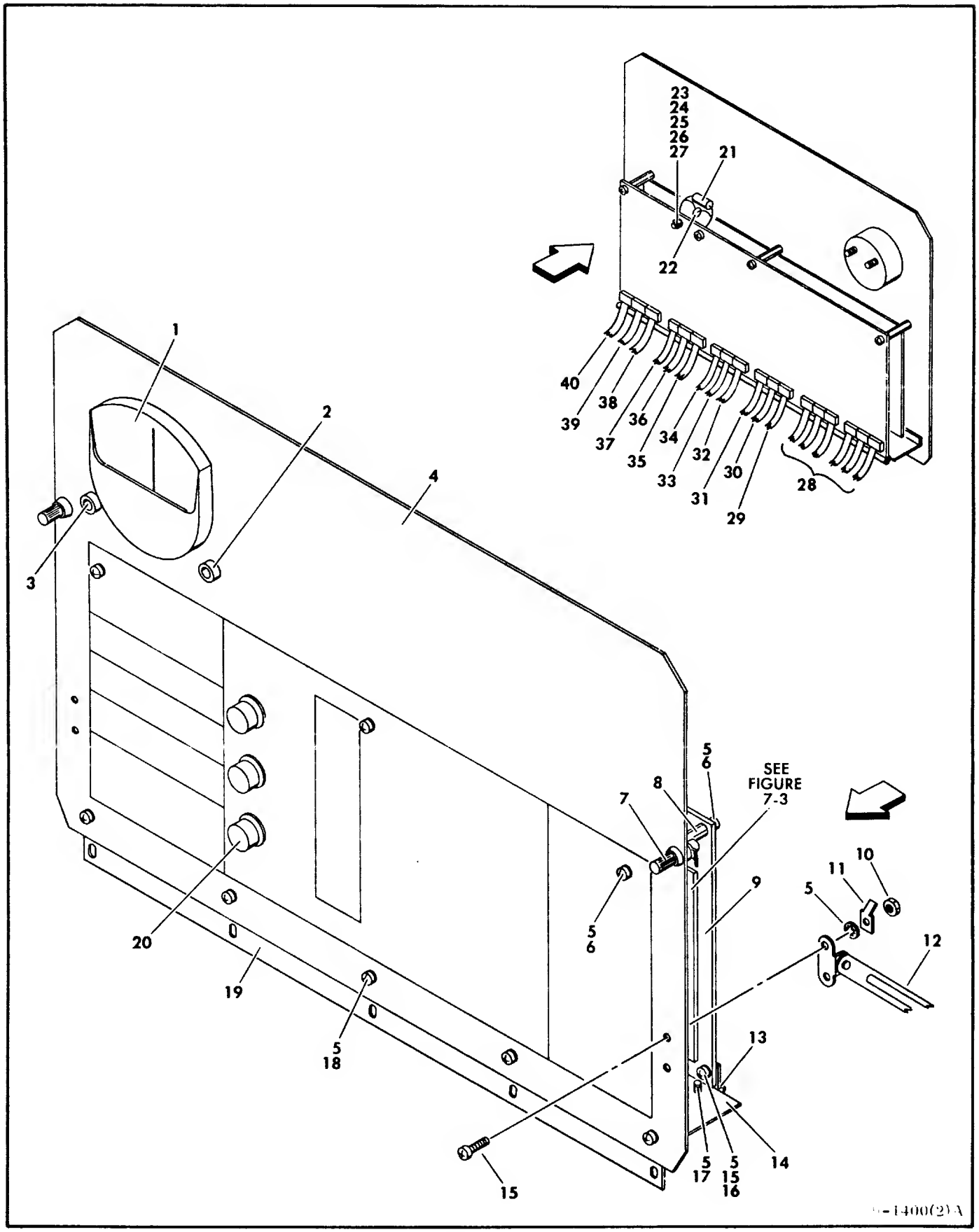


FIGURE 7-2. CONTROL PANEL, STANDARD PACKAGE

INDEX NO.	PART NUMBER	PART DESCRIPTION	NOTES
2-		FTU	
1	94559700	VOLTMETER, PANEL, DC	
2	92183003	JACK, BANANA, NYLON, RED	
3	92183001	JACK, BANANA, NYLON, BLACK	
4	77451201	PANEL, CONTROL	
5	10126103	WASHER, LOCK, INT 6-TOOTH	
6	10127111	SCREW, PAN HD, 6-32 x 1/4	
7	94358800	LATCH, ADJUSTABLE GRIP	
8	93114221	STANDOFF, TAPPED POST, HEX, ALUM.	
9	774516XX	PANEL, LOGIC, WIRE WRAP ASSY	
10	10125105	NUT, HEX, 6-32	
11	94274106	TERMINAL, QUICK CONNECT, TYPE 3	
12	94370400	SUPPORT, LID, FRICTION	PE54023
13	76390800	HINGE, IC BOARD	
14	77451300	BRACKET, BOARD MOUNTING	
15	10127113	SCREW, PAN HD, 6-32 x 3/8	
16	95510026	NUT, HEX	
17	17901508	SCREW, THREAD ROLLING, PHILLIPS, 6-32 x 1/4	
18	17901509	SCREW, THREAD ROLLING, PHILLIPS, 6-32 x 3/8	
19	76390700	HINGE, CONTROL PANEL	
20	93152009	KNOB, SKIRTED	
21	92427039	CAPACITOR, ELECTRO; 6.8μF, 35V	
22	51001119	CAPACITOR; 10,000PF, 25Y	
23	93541010	TERMINAL, RING TONGUE INS	
24	10127104	SCREW, PAN HD, 4-40 x 3/8	
25	93564004	WASHER, NYLON	
26	10126400	WASHER, LOCK, EXT 4-TOOTH	
27	10125103	NUT, HEX, 4-40	
28		I/O CABLE ASSY (SEE FIGURE 7-1)	
29	74452111	INTERCONNECT CABLE ASSY	
30	74452110	INTERCONNECT CABLE ASSY	
31	74452109	INTERCONNECT CABLE ASSY	
32	74452108	INTERCONNECT CABLE ASSY	
33	74452107	INTERCONNECT CABLE ASSY	
34	74452106	INTERCONNECT CABLE ASSY	
35	74452105	INTERCONNECT CABLE ASSY	
36	74452104	INTERCONNECT CABLE ASSY	
37	74452103	INTERCONNECT CABLE ASSY	
38	74452102	INTERCONNECT CABLE ASSY	
39	74452101	INTERCONNECT CABLE ASSY	
40	74452100	INTERCONNECT CABLE ASSY	

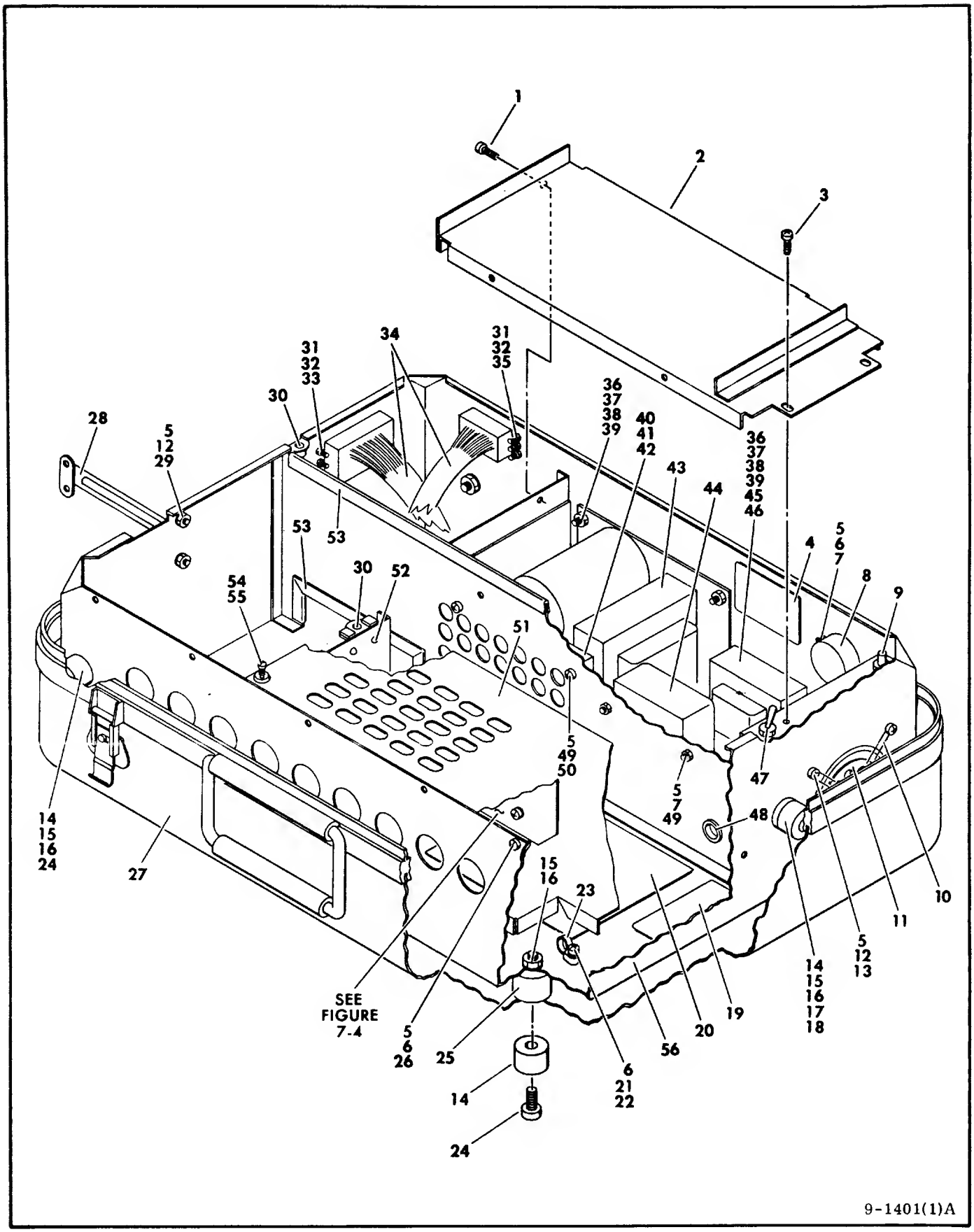


FIGURE 7-3. FINAL ASSEMBLY, RUGGEDIZED PACKAGE

INDEX NO.	PART NUMBER	PART DESCRIPTION	NOTES
1-	77449300	FIELD TEST UNIT	TB304-A
1-	77449301	FIELD TEST UNIT	TB304-B
1-	77449302	FIELD TEST UNIT	TB304-C
1	17901509	SCREW, THRD ROLLING, PHILLIPS, 6-32 x 3/8	
2	83276500	COVER, POWER SUPPLY	
3	17901508	SCREW, THRD ROLLING, PHILLIPS, 6-32 x 1/4	
4	46068603	PLATE, WARNING	
5	10125105	NUT, HEX, MACHINE, 6-32	
6	10126103	WASHER, LOCK, INT 6-TOOTH	
7	10127113	SCREW, PAN HD, PHILLIPS, 6-32 x 3/8	
8	24556501	CONNECTOR	
9	94308204	CIRCUIT BREAKER	
10	94348701	GUARD, FAN, MINIATURE	
11	94348700	FAN, MINIATURE	
12	10125803	WASHER, SPRING LOCK, 6-TOOTH	
13	92742179	SCREW, PAN HD, PHILLIPS, 6-32 x 1 7/8	
14	94202502	BUMPER, RUBBER	
15	10125301	NUT, HEX, 1/4-20	
16	10126404	WASHER, LOCK, EXT TOOTH, 1/4	
17	94047086	WASHER, SPECIAL	
18	10127351	SCREW, PAN HD, SLOT, 1/4-20 x 7/8	
19	10126600	PLATE, EQUIP IDENT	
20	72959300	LABEL, FIELD CHANGE LOG	
21	10127114	SCREW, PAN HD, PHILLIPS, 6-32 x 1/2	
22	95510026	NUT, HEX, MACH, 6-32	
23	94277421	STRAP, CABLE TIE	
24	10127154	SCREW, PAN HD, PHILLIPS, 1/4-20 x 5/8	
25	92674005	MOUNT, VIBRATION	
26	10127111	SCREW, PAN HD, PHILLIPS, 6-32 x 1/4	
27	83271800	CASE, FIBERGLASS	
28	94370400	SUPPORT, LID, FRICTION	PE54023
29	10125714	SCREW, FLT HD, CROSS-RECESSED, 6-32 x 3/8	
30	93570009	RECEPTACLE	
31	93643004	CONNECTOR, CORNER GUIDE PIN	
32	93643005	CONNECTOR, CORNER GUIDE SOCKET	
33	93642006	CONNECTOR, JACK-SCREW, MALE	
34	77453600	I/O CABLE ASSY	
35	93642007	CONNECTOR, JACK-SCREW, FEMALE	
36	10125106	NUT, HEX, MACH, 8-32	
37	10127123	SCREW, PAN HD, PHILLIPS, 8-32 x 1/2	
38	10125606	WASHER, PLAIN, 8-TOOTH	
39	10126402	WASHER, LOCK, EXT 8-TOOTH	
40	93041010	STRIP, TERMINAL, BARRIER TYPE	
41	93105110	MARKER STRIP, TYPE A-16 TERM	
42	77452100	INTERCONNECTOR, CABLE ASSY	
43	94370600	POWER SUPPLY, 5V, 6A	
44	94348402	FILTER, R.F.	SC 06 AND BELOW
44	94348403	FILTER, R.F.	SC 07 AND ABOVE
45	94368600	POWER SUPPLY, 5V, 3A	
46	83271300	PLATE, BACK-UP	
47	92509009	SWITCH, TOGGLE	
48	15012410	BUSHING, SNAP-IN	
49	10126401	WASHER, LOCK, EXT 6-TOOTH	
50	10127115	SCREW, PAN HD, PHILLIPS, 6-32 x 5/8	
51	83271500	COVER, CABLE	
52	93994000	RIVET	
53	94060001	CHANNEL, RUBBER, TYPE 1	
54	93573005	STUD ASSY	
55	93988000	WASHER, RETAINING	
56	77459900	HOUSING, FTU	SC 06 AND BELOW
56	47455600	HOUSING, FTU	SC 07 AND ABOVE
		FOR ASSEMBLIES NOT SHOWN, SEE PAGE 7-3.	

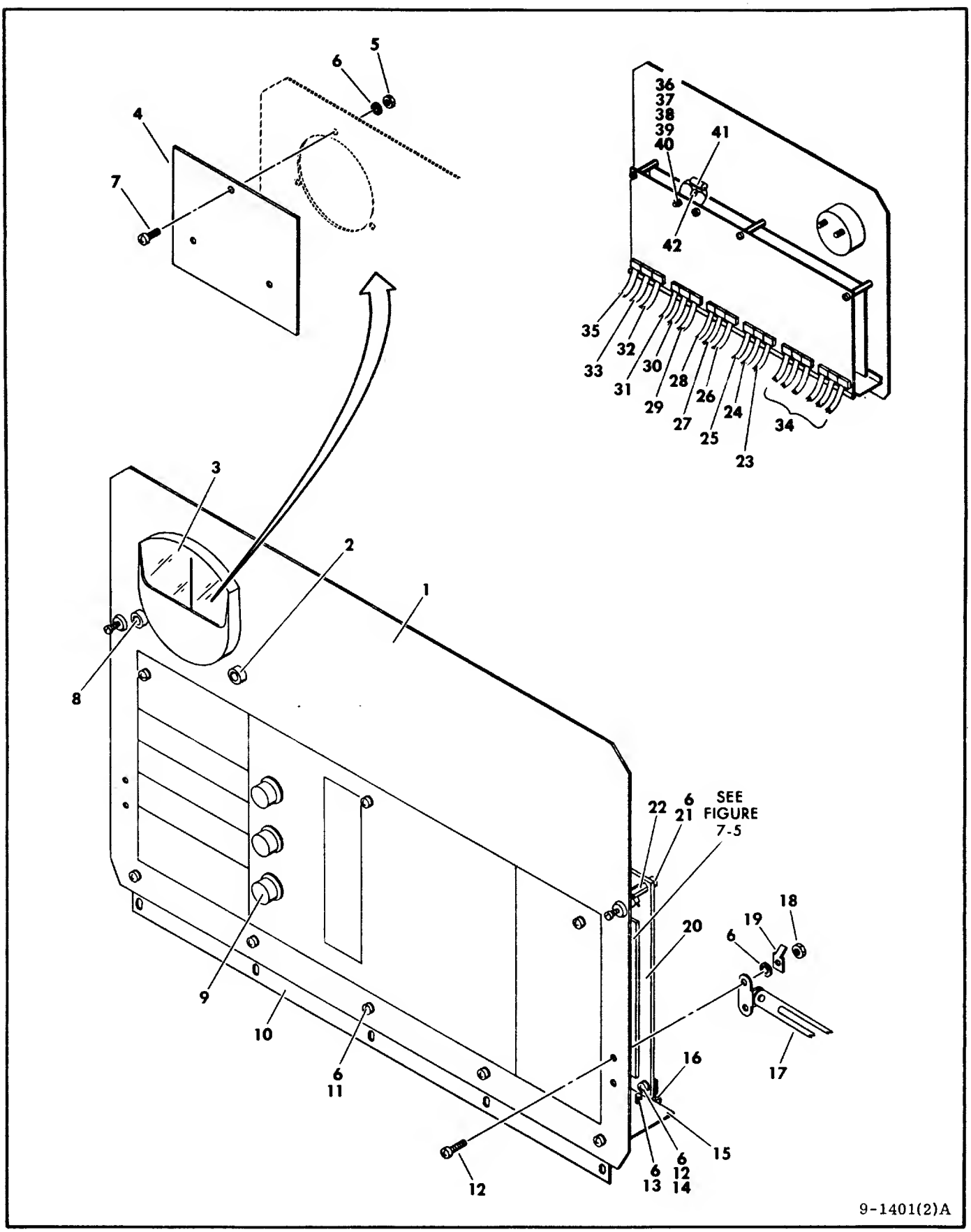


FIGURE 7-4. CONTROL PANEL, RUGGEDIZED PACKAGE

INDEX NO.	PART NUMBER	PART DESCRIPTION	NOTES
1	83276300	CONTROL PANEL, FTU	
2	92183003	JACK, BANANA, NYLON, RED	TB304 A/B ONLY
3	94359700	VOLTMETER, PANEL, D.C.	TB304 A/B ONLY
4	77459800	COVER, NULL METER	TB304 C ONLY
5	10125105	NUT, HEX, MACH, 6-32	
6	10126103	WASHER, LOCK, INT 6-TOOTH	
7	92748160	SCREW, PAN HD, PHILLIPS, 6-32 x 5/16	
8	92183001	JACK, BANANA, NYLON, BLACK	TB304 A/B ONLY
9	93152009	KNOB, SKIRTED	
10	83276200	HINGE, CONTROL PANEL	
11	17901509	SCREW, THRD ROLLING, PHILLIPS, 6-32 x 3/8	
12	10127113	SCREW, PAN HD, PHILLIPS, 6-32 x 3/8	
13	17901508	SCREW, THRD ROLLING, PHILLIPS, 6-32 x 1/4	
14	95510026	NUT, HEX, MACH, 6-32	
15	83276900	BRACKET, BOARD MOUNTING	
16	76390800	HINGE, IC BOARD	
17	94370400	SUPPORT, LID, FRICTION	PE54023
18	10125105	NUT, HEX, MACH, 8-32	
19	94274106	TERM., QUICK-CONNECT, TYPE 3	
20	774516XX	PANEL, LOGIC, WIRE WRAP ASSY	
21	10127111	SCREW, PAN HD, PHILLIPS, 6-32 x 1/4	
22	93114221	STANDOFF, TAPPED POST, HEX, ALUM.	
23	77452111	INTERCONNECT CABLE ASSY	
24	77452110	INTERCONNECT CABLE ASSY	
25	77452109	INTERCONNECT CABLE ASSY	
26	77452108	INTERCONNECT CABLE ASSY	
27	77452107	INTERCONNECT CABLE ASSY	
28	77452106	INTERCONNECT CABLE ASSY	
29	77452105	INTERCONNECT CABLE ASSY	
30	77452104	INTERCONNECT CABLE ASSY	
31	77452103	INTERCONNECT CABLE ASSY	
32	77452102	INTERCONNECT CABLE ASSY	
33	77452101	INTERCONNECT CABLE ASSY	
34	77453600	I/O CABLE ASSY (SEE FIGURE 7-3)	
35	77452100	INTERCONNECT CABLE ASSY	
36	93541010	TERM., RING TONGUE, INSULATED	
37	10127104	SCREW, PAN HD, PHILLIPS, 4-40 x 3/8	
38	93564004	WASHER, NYLON	
39	10126400	WASHER, LOCK, EXT 4-TOOTH	
40	10125103	NUT, HEX, MACH, 4-40	
41	92427039	CAPACITOR, ELECTRO, 55 V, 6.8 µF	
42	51001119	CAP, NON-ELECTRO, 25 V, 10 000 pF	

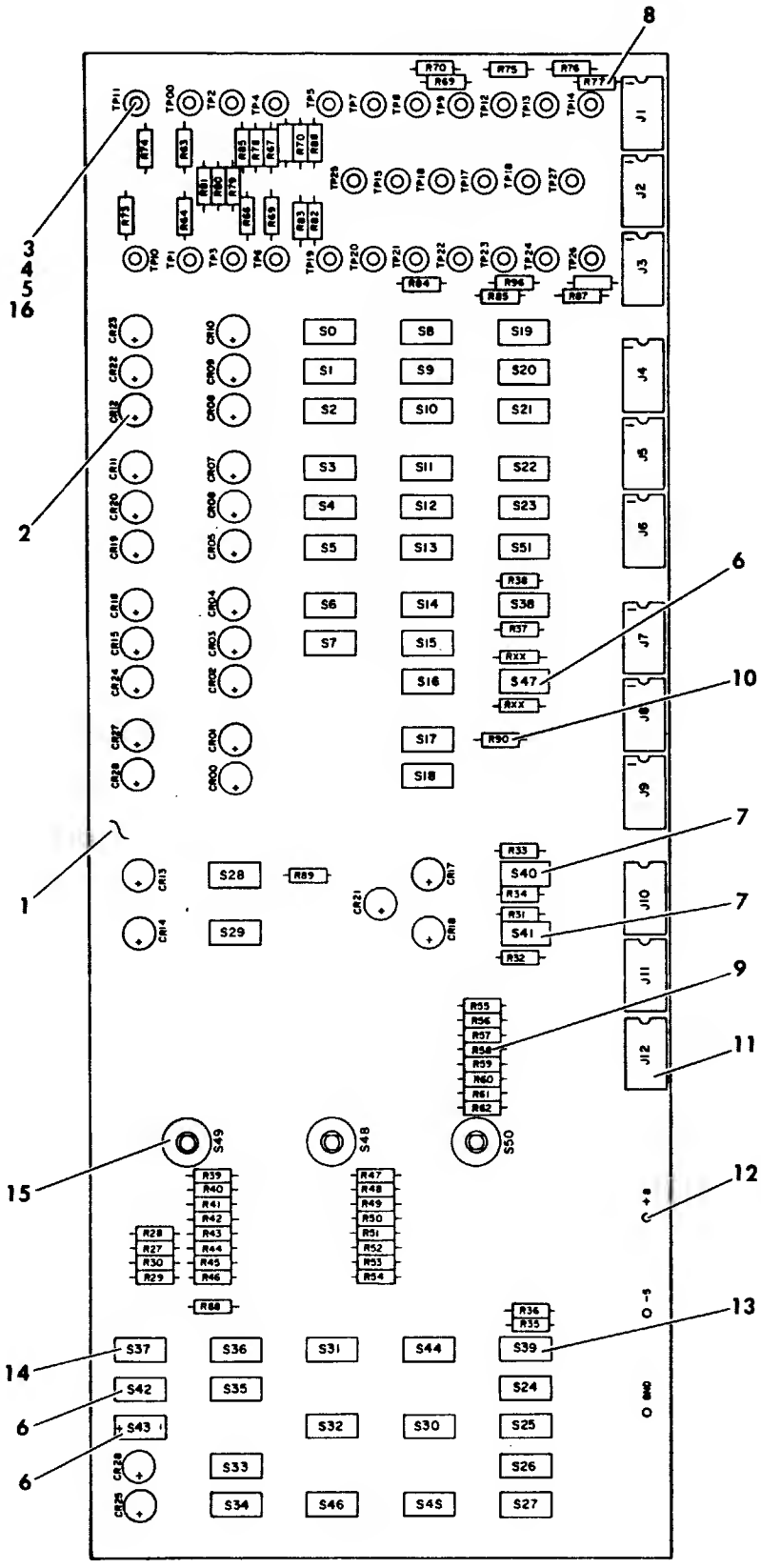


FIGURE 7-5. COMPONENT ASSEMBLY, 5VKN

INDEX NO.	PART NUMBER	PART DESCRIPTION	NOTES
3-		FTU	
	77449800	TYPE 5VKN COMPONENT ASSY	
1	77449700	TYPE 5VKN BOARD, BLANK	
2	94367113	L.E.D. LENS, DIFFUSED	
3	94363100	STANDOFF, THREADED, SWAGED	
4	95644206	BUSHING, INSULATING	
5	94390300	CONDUCTOR, NON-INSULATED	
6	94263900	SWITCH, TOGGLE, 3-POSITION: LOCKING UP/ DOWN, CENTER OFF	QTY: 3
7	94263903	SWITCH, TOGGLE, 3-POS MOMENTARY, CENTER OFF	QTY: 2
8	92512153	RESISTOR, 1/4 W, 100 OHMS	QTY: 27 (SEE NOTE 1)
9	92512258	RESISTOR, 1/4 W, 3.9K OHMS	QTY: 36 (SEE NOTE 1)
10	92512158	RESISTOR, 1/4 W, 1K OHMS	QTY: 2 (SEE NOTE 1)
11	94260300	SOCKET, IC, 14-PIN	
12	93640022	STUD, SELF-CLINCHING	
13	94263904	SWITCH, TOGGLE, 3-POS: LOCKING UP, MOMENTARY DOWN, CENTER OFF	
14	94263901	SWITCH, TOGGLE, SPDT	QTY: 43 (SEE NOTE 2)
15	94370801	SWITCH, ROTARY, 10-POSITION	QTY: 3
16	10125103	NUT, HEX, MACHINE, 4-40	

NOTES

1. TO REPLACE RESISTORS (INDEX NO'S 8,9,10), SEE CR301 THROUGH CR305 IN DIAGRAMS SECTION FOR RESISTANCE VALUE AND R-NUMBER, THEN REFER TO FIGURE 7-5 FOR LOCATION.

2. ALL TOGGLE SWITCHES NOT IDENTIFIED BY INDEX NUMBERS ARE INDEX NO. 14.

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